MEASURING PERFORMANCE OF MIDDLE EAST AIRLINES – AHP APPROACH

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ABSTRACT

Over the past decade, the airline industry has undergone a number of changes thanks to accelerated technological progress, changes in consumer preferences and turbulent political events. Bearing in mind the dynamic development of the airline industry, the concept of performance evaluation has been given increasing importance. Therefore, there is a need to further explore the defined terms and relations in order to properly respond to the changes that have occurred. Using the models of multi-criteria analysis, it is possible to perform a comprehensive assessment of an airline's performance. Accordingly, the study used the Analytic Hierarchy Process (AHP) in order to evaluate the performance of three Middle East airlines, *Emirates, Etihad and Qatar Airways*, with the goal of improving the service quality and customer satisfaction. For the purpose of conducting a comprehensive analysis, besides the AHP model, statistical non-parametric tests were used as well, in order to examine the preference of tangible and intangible components of service quality.

Key words: multi-criteria analysis and decision making; performance evaluation of the airlines; quality of the service; customer satisfaction; Analytic Hierarchy Process

1. Introduction

In a modern business environment, it is crucial for airlines to constantly adjust and improve their performance in order to stay competitive and provide a desirable flight experience to their passengers. Due to liberalization and increased global competition, meeting customer expectations is no longer sufficient to keep passengers loyal to an airline. An adequate system of evaluation and performance measurement should be in place in a dynamic business environment like aviation. Thus, it is crucial for airlines to adopt an effective performance measurement system. During the past decade, a large number of multi-criteria methods and models have been developed in order to analyze an airline's performance and provide a high level of service quality. In accordance with the above, the subject of the study is performance evaluation of the three Middle East airlines *Emirates* (Abu Dhabi, United Arab Emirates), *Etihad*

(Abu Dhabi, United Arab Emirates) and *Qatar Airways* (Doha, Qatar) using the AHP method, in order to improve the quality of their service and customer satisfaction. It is a multi-criteria decision-making problem with the goal of determining which components of service quality passengers consider most important when choosing an airline, as well as which of the three airlines has the highest level of service quality. Besides that, the study aims to determine whether passengers consider tangible (physical) or intangible (human factor) dimensions of service quality more important. Accordingly, a multi-criteria decision-making model was created in Expert Choice software in order to perform the evaluation of the model elements, criteria and alternatives. Considering the structure of the study, the introduction summarizes a multi-criteria decision-making problem in relation to the performance evaluation of the airlines, followed by a brief overview of the literature and description of the methodology used. In the study, the emphasis is on implementing the AHP method, a well-known and validated approach for solving complex, multi-criteria decision-making problems. Besides the AHP model, statistical non-parametric tests were also used, in order to evaluate the preference between tangible and intangible components of service quality. It is crucial to structure the decision-making problem in the correct way and to select adequate criteria, in order to be able to choose the optimal alternative. Hierarchical decomposition of the defined problem greatly enhances transparency and contributes to more efficient problem solving, thereby increasing the consistency of decision-making and reducing the errors.

2. Literature review

Performance evaluation and measurement has recently become a significant research interest since it is crucial in a dynamic business environment that each company has an effective performance management system. This requires a measurement of different indicators, i.e. performance criteria that are in accordance with the defined strategy of the organization. Armstrong and Murlis (2007) emphasized that it is a natural and basic management process that should be led by the management and form an integral part of their daily work practice. In this context, it is important to mention the study of Tangen (2005), who divided all the methods for evaluation of organizational performance into three categories depending on the system requirements for performance measurement, as well as on the applied approach i.e. what should be measured and how it should be measured. An effective performance measurement system allows a company to measure its performance in accordance with the defined strategy. Numerous authors used the Analytic Hierarchy Process (AHP) in their research, and a good overview of AHP applications is given by Vaidya and Kumar (2006), Sipahi and Timor (2010), Ishizaka and Labib (2011) and Subramanian and Ramanathan (2012). However, none of them used AHP for the performance evaluation of Middle East airlines. When it comes to the quality of service in the airline industry, many authors have discussed this topic, especially since the relationship between customer satisfaction and airline profitability has been established (Namukasa, 2013; Kamakura et al, 2002; Bukhari, Ghoneim, Dennis & Jamjoom, 2013, etc). As the airline industry belongs to the service sector where most of the airlines offer competitive prices and loyalty programs, the main form of differentiation is superior service quality. Park, Robertson & Wu (2004) emphasized that the service quality is a key factor for an airline's survival and sustainability. On the other hand, amongst the studies related to airline service quality and passenger satisfaction, the following authors can be distinguished: Campbell & Vigar-Ellis (2012), Massarat & Jha (2014), Yayla-Kullu & Tansitpong (2013), De Jager & Van Zyl (2013). When it comes to performance evaluation of the Middle East airlines,

research carried out by Massarat & Jha (2014) and Surovitskikh (2007) can be distinguished. Both authors applied the SERVQUAL model in their studies in order to assess the service quality of Middle East airlines. The passengers were asked to evaluate the five dimensions of the model in order to determine what is important when choosing a carrier. When it comes to the evaluation of service quality of three Middle East airlines, so far no similar research has been done using the same methodology; hence, this study represents a theoretical and practical contribution within the given area of research.

3. Methodology

The Analytic Hierarchy Process (AHP) is a theory of measurement through pairwise comparisons that relies on the judgements of experts to derive priority scales (Table 1, Saaty & Kearns, 1985). It is an intuitive method for formulating and analyzing decisions which can be successfully used to measure the relative impact of multiple factors on possible outcomes, as well as to forecast their relative probabilities. The structures of the AHP must include all the factors used to determine the best outcome; thus, the outcome is a result of the factors included and the judgments used. The Analytic Hierarchy Process breaks down the decision-making problem into its key elements according to their common characteristics, in the form of a hierarchical model. The problem is usually formulated as a three level hierarchy with the explicitly defined goal at the highest level, criteria on the next lower level and alternatives on the lowest level. Hierarchical structuring is an effective process that helps each decision-maker cope with the complexity of the problem. Once a hierarchical structure is formed, pair-wise comparisons are conducted in order to determine the relative strength of the elements in the hierarchy. At this stage, the decision-maker's preferences play a key role in the problem-solving process. The comparisons are made using a scale of absolute judgements that represents how much more one element dominates another with respect to a given attribute (Saaty, 2008). When comparing a pair of criteria, the question to be asked is what is more important or what has a greater impact, based on which their relative significance is determined. However, when comparing two alternatives with respect to a particular criterion, it should be determined what is more preferable. The overall preference of an alternative is calculated as a weighted sum of the criteria and alternative results for that particular criterion.

Table 1
Scale of comparison 1–9

Intensity of importance	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favor one activity over another
5	Strong importance	Experience and judgment strongly favor one activity over another
7	Very strong or demonstrated importance	An activity is favored very strongly over another; its dominance demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Mean value of two estimates	A compromise is needed
Reciprocals of the above		If activity *i* has one of the above nonzero numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with *i*

Source: Saaty, T. L. & Kearns P. K. (1985)

Once the estimations are done for each part of the model, the information is synthesized in order to show the general overall preference. The synthesis provides a complete ranking of the alternatives with respect to the main goal, where the rank shows how each alternative is evaluated against each criterion. However, the judgements may be inconsistent, thus it might be required to change the judgements in order to obtain better consistency. An important indicator of consistency is the consistency index, where the value should be below 10% in order to be acceptable, otherwise decision-makers should reconsider their estimates and seek additional information.

4. Structure of the research problem

Previously conducted studies considered various dimensions of service quality whilst evaluating airline performance; therefore, they have been more or less complex and comprehensive compared to the conducted study. The authors, Bowen, Headley & Luedtke (1992), have considered nineteen different factors of service quality when evaluating airlines. These factors include fleet size and age, fares, baggage handling, passenger complaints, staff kindness, etc. On the other hand, Tsaur, Chang and Yen (2002) identified the following criteria as the most important ones when it came to Taiwanese airlines: staff courtesy and responsiveness, safety, cabin cleanliness, comfort, in-flight entertainment and good flight connections. Generally, there are different dimensions of the airline service quality that can be grouped into two categories: tangible, i.e. the physical quality that can be measured (quality of meals, seat comfort, cabin cleanliness, IFE) and intangible (staff kindness, physical appearance, language proficiency, handling passenger complaints) and their importance largely depends on the subjective assessment of the service users. The

distinction between these two groups is often not clear, so some of the above dimensions, such as language proficiency, can belong to both categories. However, for the purpose of this analysis, we will consider it as an intangible dimension.

In order to perform the analysis, evaluation data was collected from passengers and experts in the aviation industry. For the purpose of the analysis, two types of questionnaires were used with precisely defined questions related to the service quality and customer satisfaction. The sample included 200 respondents, i.e. the passengers of the three airlines, *Emirates, Etihad* and *Qatar Airways*. The distribution of the questionnaires was done electronically and in person. In the first questionnaire, a Likert scale from 1 to 5 was used and the passengers had the opportunity to evaluate the importance (preference) of tangible and intangible dimensions of service quality (see Appendix). In the second questionnaire, Saaty's scale from 1 to 9 was used in order to rate the importance, i.e. preference of 8 selected service quality components, as well as to evaluate the service quality of each of the three airlines.

4.1 Survey 1 – evaluation of preferences by Likert scale

In the first survey, passengers were given the opportunity to express whether they considered tangible or intangible components of service quality to be more important. They expressed their preference by using a Likert scale from 1 to 5, with 1 being the lowest and 5 the highest preference (see Survey I in Appendix). In order to carry out the mentioned analysis, two non-parametric tests were used, Chi-square test and Kolmogorov-Smirnov test.

Table 2
Tangible and non-tangible criteria

Tangible Criteria	Quality of meals	Seat comfort	Cabin cleanliness	IFE (movies, etc)
Non-tangible criteria	Kindness of staff	Physical appearance	Language proficiency	Handling passenger's complaints

Table 3
Evaluating the importance of tangible criteria

Value	Observed N	Expected N	Residual
3,00	14	66.3	-52.3
4,00	66	66.3	-.3
5,00	119	66.3	52.7
Total	199		

Source: *SPSS* software

Table 4
Evaluating the importance of non-tangible criteria

Value	Observed N	Expected N	Residual
3,00	14	66.7	-52.7
4,00	65	66.7	-1.7
5,00	121	66.7	54.3
Total	200		

Source: *SPSS* software

Table 5
Chi-square test for evaluating the importance of tangible & intangible components of service quality

	Tangible	Non-tangible
Chi-Square	83.106[a]	85.930[b]
Df	2	2
Asymp. Sig.	.000	.000

Source: *SPSS* software

Table 6
Kolmogorov-Smirnov test for evaluating the importance of tangible & intangible components of service quality

N		199	200
Normal Parameters[a,b]	Mean	4.5276	4.5350
	Std. Deviation	.62603	.62508
Most Extreme Differences	Absolute	.373	.377
	Positive	.225	.228
	Negative	-.373	-.377
Kolmogorov-Smirnov Z		5.258	5.325
Asymp. Sig. (2-tailed)		.000	.000

Source: *SPSS* software

Based on the test results, we concluded that there is a statistically significant difference in the importance of tangible and intangible criteria if the risk of error is below 1%. Although the difference is almost negligible, the results of both tests (Tables 3 & 4) show that passengers find the intangible criteria (human factor) more important in relation to the tangible (physical component). This conclusion is based on the obtained Chi-square test value which is 83,106 for tangible criteria and 85,930 for intangible (Table 5). By observing the results of the Kolmogorov-Smirnov test, a similar conclusion can be reached, as the test value of the tangible criteria was 5.258 and of the intangible 5.325 (Table 6). Even though the difference is extremely small, it can be concluded that passengers of the ME airlines slightly favor the intangible dimension of the service quality over the tangible one. This indicates the growing importance of the human factor (the intangible component), as it can significantly

affect the perception of the service quality, while the physical component can be easily copied thanks to modern technological solutions.

4.2 Survey 2 – Prioritization and ranking of airlines: AHP model

As stated above, the empirical part of the research is focused on the performance evaluation of three Middle East airlines *Emirates, Etihad* and *Qatar Airways*, in order to improve the quality of their service and customer satisfaction. The study seeks to determine which components of the service quality passengers consider most important when choosing an airline, as well as which of the three airlines has the highest level of service quality and customer satisfaction.

With reference to the previously conducted studies and available literature, the most common tangible and intangible components of the airline service quality were identified. Accordingly, the experts from the aviation industry selected the eight most important components, which were then evaluated by the passengers of the three mentioned airlines using Saaty's scale from 1 to 9. Following the pairwise comparisons of the criteria, the alternatives were pairwise compared with respect to each criterion. The illustration below shows the hierarchical structure of the defined multi-criteria decision-making problem in the AHP software (Figure 1).

GOAL								
				ME Airlines evaluation & ranking				
					CRITERIA			
	Quality of the meals	*Seat comfort*	*Cabin cleanli -ness*	*IFE (movies etc)*	*Kindness of staff*	*Physical appearance*	*Language proficiency*	*Handling passenger's complaints*
					ALTERNATIVES			
				Emirates	*Etihad*	*Qatar*		

Figure 1 AHP model of airlines evaluation and ranking

Bearing in mind the defined hierarchical structure, the main goal is to evaluate and rank the three Middle East airlines. The selected criteria, four tangible (quality of meals, seat comfort, cabin cleanliness, in-flight entertainment) and four intangible (staff kindness, physical appearance, language skills and handling complaints) are on the level below. At the lowest level are the alternatives, *Etihad, Emirates* and *Qatar Airways* which are evaluated against the elements on the higher hierarchical levels, i.e. criteria and goal. The main condition for the implementation of the AHP model in this study was that all the interviewed respondents (passengers and staff) had used the services of the three Middle East airlines at least once.

5. AHP model results

After defining the elements of a decision-making problem, the pairwise comparisons followed (see Survey II in Appendix). Firstly, all the criteria were compared in pairs with respect to the main goal in order to determine their relative importance, i.e. contribution to the main goal. The same process was repeated, for 200 respondents, after which the geometric mean of the obtained criteria weights of all individual evaluations was calculated. These were ultimately calculated for 120 respondents because the others were eliminated due to inconsistent responses and misunderstanding of the AHP methodology. When there are multiple decision makers, in order to find the final weights, i.e. priorities of the criteria and the ranks of

the alternatives, the following formula is used to calculate the geometric mean (Saaty & Peniwati, 2008).

$$w_i = \sqrt[K]{\pi_{k=1}^{k=K} w_{ik}} \quad \forall \ i \qquad (1)$$

where w_i represents the final weight of the i criterion, and w_{ik} the relative weight of the i element calculated using k evaluator.

In accordance with the above, the geometric mean of all 120 criteria evaluations from all the respondents, is the following:

$$w_i = \sqrt[120]{\pi_{k=1}^{k=120} w_{ik}} \quad \forall \ i \qquad (2)$$

where for criterion K1 the final weight of the estimates of all 120 respondents is equal to:

$$w_{K_1} = \sqrt[120]{w_{K_1 1} \times w_{K_1 2}, \ldots, \times w_{K_1 120}} = 0{,}04989 \qquad (3)$$

Following the same logic, the priorities of the criteria were calculated using the geometric mean of the weighted coefficients of all individual AHP evaluations within the model (Table 7).

Table 7
Obtained criteria weights within AHP method

Criteria	Priority
Airlines Ranking	0.00000
1. Quality of meals	0.04989
2. Seat comfort	0.30786
3. Cabin cleanliness	0.12102
4. IFE	0.02654
5. Staff kindness	0.26115
6. Physical appearance	0.03609
7. Language proficiency	0.06476
8. Handling complaints	0.13270
Consistency Index: 0.09 (9%)	

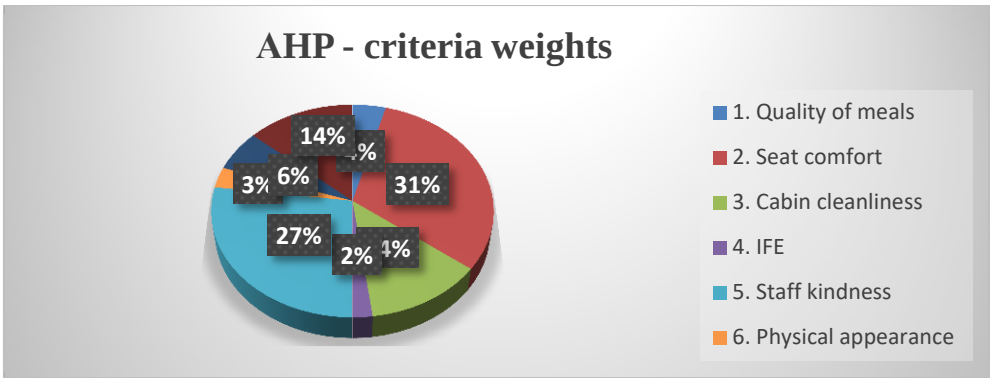

Figure 2 Obtained criteria weights (priorities)

By observing the obtained criteria weights, it can be noticed that the greatest importance for the passengers is seat comfort (0.307), followed by staff kindness (0.261), with the lowest priority being in-flight entertainment (0.026). This indicates that passengers rated this criterion as the least important when choosing an airline. For intangible criteria, the lowest ranked criterion is physical appearance of the staff (0.036). The advantage of the AHP method is the ability to measure the error in reasoning by calculating a consistency index for the resulting matrix of comparisons. In the table above, the consistency index (CI) was approximately 0.09 which is within the acceptable limits as it is lower than 0.10 (10%). If CI was greater than 10%, the reasons behind the inconsistency should be determined and the pairwise comparisons should be repeated. If the repetition of the procedure does not lead to an acceptable limit of 0.10, all the results should be discarded and the entire process should be repeated from the beginning. In our model, the estimations were repeated several times whenever the inconsistency was greater than 0.10, and the respondents were willing to make it consistent. Subsequently, the overall consistency index, calculated as the geometric mean of all individual consistency indices, was approximately 0.09. Following the comparisons of the criteria, the next step was to pairwise compare all the alternatives (airlines) against each criterion, in order to calculate their local priorities and the final ranks by finding the geometric mean of all respondent's evaluations. When two alternatives are compared with respect to a particular criterion, the general preference of an alternative will be calculated as the weighted sum of criteria weight and the alternative result for that respective criterion (Saaty & Kearns, 1985). Firstly, the pairs of alternatives are compared with respect to each criterion to obtain their local priorities, while their global priorities are obtained by the synthesis of the results in relation to all criteria simultaneously. The final results indicate the ranking of the alternative on each criteria as shown in Table 8.

Table 8
AHP local priorities of alternatives with respect to each criterion

Criteria/Alternatives	Emirates	Etihad	Qatar
1. Quality of meals	0.287	0.600	0.111
2. Seat comfort	0.222	0.624	0.131
3. Cabin cleanliness	0.426	0.310	0.182
4. IFE	0.234	0.650	0.112
5. Staff kindness	0.188	0.595	0.183
6. Physical appearance	0.215	0.523	0.199
7.Language proficiency	0.293	0.526	0.160
8. Handling complaints	0.157	0.471	0.337

The results (Table 8) show that *Etihad Airways* has the most favorable results except on the cleanliness of the cabin criterion. It can also be noted that *Qatar Airways* is ranked lowest for all criteria, except for handling passenger's complaints.

Table 9
Final priorities of the alternatives within AHP model

Name	Ideals	Normals	Raw	Ranking
Emirates	0.437062	0.239803	0.119901	2
Etihad	1.000000	0.548670	0.274335	1
Qatar	0.385526	0.211527	0.105763	3

Table 9 shows the final priorities of the alternatives calculated as the geometric mean of the final priorities of all individual assessments within the AHP model. Based on the obtained results, we concluded that *Etihad Airways* is the optimal choice for the passengers with a synthesized global priority of 0.548. *Emirates Airlines* is the second best alternative with a global priority of 0.239, while *Qatar Airways* is the lowest ranked alternative with a global priority of 0.211.

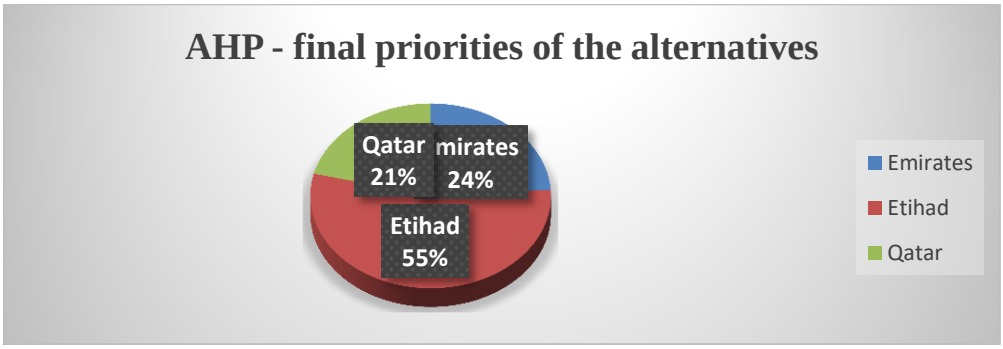

Figure 3 Final (global) priorities of the alternatives

The final outcome is not surprising given the fact that *Etihad Airways* had better ratings in seven out of eight selected criteria in comparison with the other two airlines. Finally, a sensitivity analysis was carried out in order to identify the impact of the change in criteria weights on the alternatives ranking.

Table 10
The sensitivity of alternative priorities, as a consequence of changing the relative importance of the criteria cabin cleanliness (calculated using Superdecision software)

Cabin cleanliness	Emirates	Etihad	Qatar
0.000	0.184	0.584	0.232
0.071	0.192	0.579	0.229
0.143	0.201	0.573	0.226
0.214	0.209	0.568	0.223
0.286	0.218	0.562	0.219
0.357	0.227	0.557	0.216
0.429	0.235	0.551	0.213
0.500	0.244	0.546	0.209
0.571	0.253	0.540	0.207
0.643	0.261	0.535	0.204
0.714	0.269	0.529	0.200
0.786	0.279	0.524	0.197
0.857	0.287	0.519	0.194
0.929	0.296	0.513	0.190
1.000	0.304	0.508	0.188

Table 10 shows the priorities of the three airlines as cabin cleanliness relative weight, i.e. importance, is increased. The results show that the increase in importance of cabin cleanliness from 0.000 to 1.000 does not significantly affect the final ranking of the alternatives. However, it will lead to a somewhat lower priority for *Etihad Airways* and higher priority for *Emirates*. The priority of *Emirates* increased from 0.184 to 0.304, while the priority of *Etihad* and *Qatar Airways* decreased from 0.584 to 0.508 and from 0.232 to 0.188 respectively. In any case, *Etihad* will still represent the optimal choice for travelers since the sensitivity analysis clearly showed that the system is robust and that small or even bigger changes in the criteria weights will not significantly affect the overall ranking in terms of the best alternative. This confirms that a certain inconsistency in the pairwise comparison that caused a slight difference in criteria weights will not affect the final ranking of the alternatives. Accordingly, it can be concluded that *Etihad Airways* is the optimal choice for the travelers and it can be chosen with full confidence. Similar results are obtained with respect to other criteria as well, except for seat comfort. It was observed that when this criteria weight increases from 0.001 to 0.999, the final priority of *Emirates* also increases from 0.17 to 0.48, while the priorities of *Etihad* and *Qatar Airways* decrease from 0.61 to 0.35 and 0.22 to 0.17 respectively. The change in criteria weight will result in rank inversion, so *Emirates* will become the highest ranked alternative if the seat comfort weight increases from 0.5 to 0.667 (Figure 4).

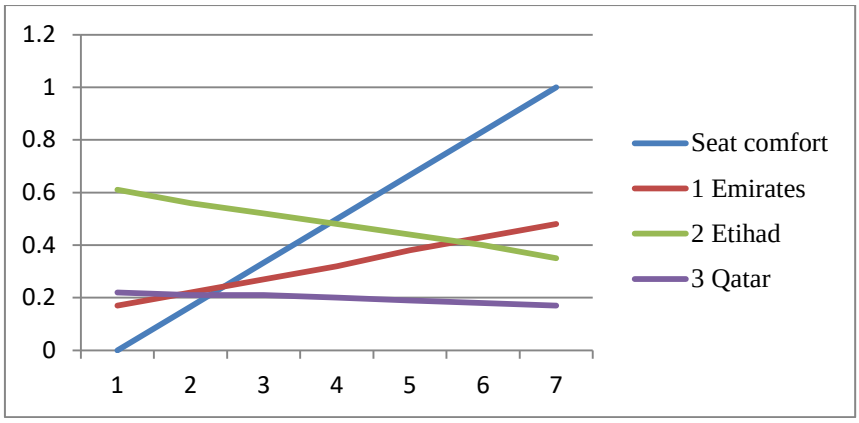

Figure 4 Dynamic sensitivity diagram after changing the weight of the "seat comfort" criteria (Superdecision software)

6. Conclusion

In accordance with the conceptual framework of the research, a further theoretical and practical contribution to the development of this research area is expected. It can be concluded that the conducted research has provided a theoretical and practical contribution to the further development of this area of research. The results can serve as important guidelines for the management of the Middle East airlines, as well as for the other airlines around the globe. The results of the study showed that the AHP method of multi-criteria analysis gives a comprehensive performance assessment of the airlines that will contribute to greater service quality and customer satisfaction. In order to carry out a detailed analysis, it is important to take into account all the components of the service quality that are important for the passengers when choosing an airline. Thanks to the implementation of the AHP method, the most important criteria were identified and evaluated which can give information to the management of the airlines about their service quality and how the passengers perceive it. The results showed that the passengers of the three airlines found seat comfort and staff kindness as the most important factors, while physical appearance (grooming) and in-flight entertainment are the least important. On the other hand, when it comes to the ranking of the alternatives, *Etihad Airways* is their preferred choice bearing in mind the selected criteria. *Emirates Airlines* is the second best choice, while *Qatar Airways* is the lowest ranked option, though both *Emirates Airways* and *Qatar Airways* are far less preferred than *Etihad Airways*.

The sensitivity analysis confirmed that the system is robust and that small or even bigger changes in the relative weights of the criteria will not significantly impact the overall ranking when it comes to choosing the best alternative. This is useful information for travelers, as well as for future researchers within the airline industry. The conducted analysis shows the growing importance of multi-criteria methods in solving complex decision-making problems. On the other hand, when it comes to the statistical analysis that was used for evaluating the importance of tangible and intangible components of the service quality, the results have pointed out the growing importance of the intangible component, i.e. human factor. However, as the obtained difference between tangible and intangible criteria is negligible, it can be concluded that the service quality is a multi-dimensional concept where all of its elements, as a whole, have a synergetic impact on the passenger's satisfaction. It is very important

that the airline management is aware of this fact, so that its focus is on all the aspects of the service quality. Based on the results of the conducted research, a positive impact on the further development of the economic theory and practice can be expected. The theoretical contribution is the enrichment of the literature, along with a precise definition of the factors in the research. On the other hand, the practical contribution is that passengers have more information to inform their decision making about airlines as well as helping managers design an effective business strategy that will enhance their airline's competitiveness and sustainability. The limitations and shortcomings of the conducted research are mainly related to data collection, sample structuring and the number of service components that were taken into consideration. Data was collected primarily from passengers in the Abu Dhabi airport, as well as from the employees of the three airlines. However, since the *Emirates* and *Etihad* hubs are located within a relatively small geographical distance in the UAE, the majority of the respondents were their passengers, while *Qatar Airways* passengers represented a smaller portion of the sample. This limitation has perhaps been reflected in the final results; therefore, it is important to highlight it. Another disadvantage is that only eight components of service quality were taken into account. Bearing that in mind, the empirical research would be much more comprehensive with a larger number of service components which has useful implications for future researchers. None of the previous studies used the AHP method in the evaluation of the service quality of these three ME airlines.

The problem could be further analyzed, in turn delivering more detailed and comprehensive results if sub-criteria were identified and new criteria added, and if direct and reverse interactions were considered within and among the groups of different sub-criteria. This would render the problem even more complex, while on the other hand it would show the actual situation in a more realistic manner. Such problems could be resolved by applying the Analytical Network Process, as an extension of the AHP model, that includes complex networks of influence between the model elements regardless of the level at which they are located.

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APPENDIX

SURVEY I

a) Please evaluate 3 ME airlines based on the 4 tangible & 4 non-tangible criteria below:

For that purpose use the following **Likert scale** with the range 1-5, with the following meanings:
1 = low quality/satisfaction
5 = high quality/satisfaction

Tangible Criteria/ Alternative	Quality of meals	Seat comfort	Cabin cleanliness	IFE (movies, etc)
Emirates				
Etihad				
Qatar				

Non-tangible criteria/ Alternative	Kindness of staff	Physical appearance	Language proficiency	Handling passengers' complaints
Emirates				
Etihad				
Qatar				

1 **Please evaluate your overall satisfaction with the service quality of each ME Airline:**

Emirates	**Etihad**	**Qatar**

1 = completely unsatisfied
5 = completely satisfied

2 Please evaluate the importance of tangible & non-tangible criteria using the Likert scale:

Tangible criteria	**Non-tangible criteria**

1 = not very important
5 = very important

SURVEY II

a) Assessing CRITERIA importance according to the main goal

Please assess the importance of the following criteria when evaluating the airline:

Which of the 2 criteria below is more important to you, and by how much, having in mind the main goal of AHP model: Evaluation and ranking of 3 ME airlines?

*For that purpose use the following **Saaty scale** with the range 1-9, with the following meanings:

Thomas Saaty scale for comparison 1-9

Intensity of importance	Definition
1	Equal importance
3	Somewhat more important
5	Much more important
7	Very much more important
9	Absolutely more important
2, 4, 6, 8	Intermediate values

Criteria evaluation matrix	Quality of meals	Seat comfort	Cabin cleanly-ness	IFE (movies, etc)	Kindness of staff	Physical appear-ance	Language proficiency	Handling passenger's complaints
Quality of meals	**1**							
Seat comfort		**1**						
Cabin cleanli-ness			**1**					
IFE (movies,etc)				**1**				
Kindness of staff					**1**			
Physical appearance						**1**		
Language proficiency							**1**	
Handling passenger's complaints								**1**

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b) Evaluating ALTERNATIVES (airlines) preference according to 8 criteria below

When comparing 2 airlines below, which one you prefer, having in mind the chosen criteria below?(for every criteria individual)

Alternative	Emirates	Etihad	Qatar
Emirates	**1**		
Etihad		**1**	
Qatar			**1**

*For evaluation purpose, please use the same Saaty scoring scale with the range 1-9.