

AN APPLICATION OF ANALYTIC HIERARCHY PROCESS IN THE HOSPITALITY INDUSTRY

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ABSTRACT

AHP is introduced as a decision making tool for the evaluation of investment alternatives in the hospitality industry. Services are intangible and perishable outputs that are created and consumed simultaneously or nearly simultaneously. The AHP, as a systematic approach that encompasses subjective criteria, alleviates the difficulties encountered in the evaluation of service industry operations. The proposed hierarchical structure in this paper deals with a minor investment project of the holiday village. However, it is possible to extend and apply it for larger investment projects in the hospitality industry as a decision making tool through clustering. Expert Choice for Windows (Version 9.0) is used to solve the decision problem.

1. Introduction

The main objective of a decision making process is to determine the best alternative. The success of decisions in investment projects is dependent on a careful preliminary evaluation of the case being considered.

Classical project evaluation techniques, which are basically quantitative models, provide alternative solution sets to the decision makers but, generally, do not include subjective criteria. These techniques may become inapplicable if the criteria involved are intuitive, qualitative, and unconcrete.

Subjective criteria, that encompass qualitative and intangible conceptions, are based on managerial perceptions and judgements. For example, it is difficult to express qualitative conceptions such as environmental setting and customer satisfaction in quantified values, and fit them in a mathematical model. Analytic Hierarchy Process (AHP) developed by Saaty (1988) is a multiple criteria decision making approach that may be utilized for solving such problems. As a systematic approach to decision making processes encompassing subjective criteria, AHP provides a better explanation and evaluation of the problem by presenting the decision makers the model in a hierarchical structure. Measurement of consistency ratio of the pairwise comparisons is an important factor that determines the consistency of the decision makers. It is an effective approach to the solution of real life problems.

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Various managerial and engineering applications of AHP have been introduced and extensively discussed in the literature. Some examples of AHP applications are selection of assembly systems (Shtub and Dar-el, 1989), technology choice (Kleindorfer and Partovi, 1990), site selection (Hedge and Tadikamalla, 1990), project risk assessment (Mustafa and Al-Bahar, 1991), inventory problems (Partovi and Hopton, 1994), forecasting foreign exchange rates (Ulengin and Ulengin, 1994), location analysis of international consolidation terminals (Min, 1994), and facility layout (Shang, 1993).

2. Analytic Hierarchy Process

AHP is a systematic approach of measurement concerned with dominance priorities from pairwise comparisons of homogeneous elements with respect to a common criterion or attribute. Such measurements can be extended to nonhomogeneous elements through "clustering" as introduced by Saaty (1994). Structuring the decision problem as a hierarchy (1), Judgement of the criteria at each hierarchical level by pairwise comparison (2), and Determination of the composite weights of the decision alternatives (3) are the three main steps in AHP.

In the first step, the multiple criteria decision making problem is transformed into a hierarchical structure to determine the main elements being considered. The structuring process begins by setting the overall objective at the top of the hierarchy and continues by placing criteria, subcriteria, and decision alternatives at the lower levels.

In the second step, decision makers are asked to make pairwise comparisons to judge the relative importance of each element at each level with respect to an element at the next higher level of the hierarchy formed in the first step. The scale developed by Saaty (1990) is used for the judgement process. The quantified judgements obtained by pairwise comparisons are transferred to square matrices that are called comparison matrices. After the creation of the comparison matrices, relative weights are computed for various elements. The calculation of the relative weights is based on the determination of the normalized eigenvector that has the highest eigenvalue of the comparison matrices. The detailed knowledge about the mathematical aspects of this process is provided by Saaty (1990). The eigenvalue is used to measure the consistency of the decision makers' judgements, and the eigenvector to determine the relative weights.

The third step deals with the determination of composite weights of the decision alternatives. The determination of composite weights of the decision alternatives is accomplished by following a path from the top of the hierarchy to each alternative at the lowest level. The relative weights of the decision alternatives are multiplied by the weight of the corresponding criterion along each segment of the path and added. The result of this aggregation is a normalized vector of the

overall weights of the alternatives. It indicates the relative importance of the decision alternatives in regard to the overall goal.

3. Application of AHP in a holiday village

3.1. Identification of the problem

The holiday village in this study is a 738-bed capacity establishment with five pools that is built on an area of 72 000 square meters. Two of the pools are for children and the other three for adults. The holiday village has also four bars at different locations. These bars are located near the beach, under the restaurant, near one of the pools, and at the disco.

The open theater, where the evening entertainment shows take place, is located by the pool that is near the beach. This pool is comparatively larger than the other four pools and will be called the "big pool" hereafter. The day entertainment shows also take place around the big pool. The customers may procure soft drinks and fast foods during the day from the bar near the beach. This is a very important point of consideration for the management because of the reason that there are also half-board customers in the holiday village. Lobby bar, which is under the restaurant, is a very active location after the evening meals. Being on the way to the open theater, many customers purchase drinks from this bar before they go to watch the evening entertainment shows. Another pool is located between the big pool and the wood. This pool is at a longer distance to the beach in comparison to the big pool. This pool will be called the "middle pool" hereafter. The bar near the middle pool is different from the other bars in certain aspects. Because it is away from the beach and the day entertainment shows, customers preferring silence come to this bar. In the evenings, this bar is still a quiet location of the holiday village, and price reductions are offered which makes it attractive.

In one season, the evening entertainment shows were transferred from the open theater to a temporary platform that was set up by the middle pool. This caused an increase in the revenues of the bar at this location. Hence, the management began to consider building another open theater near the middle pool. However, building a new open theater at this location might probably create some undesired problems for the holiday village. Thus, the management is faced to decide for one of the following investment alternatives :

- (a) To build a new open theater near the middle pool,
- (b) To reorganize the present open theater, or
- (c) To reorganize the bars and their environments.

The reorganization of the bars and their environments covers the tasks of shortening service in order to increase customer satisfaction, and building a bridge

from the middle pool to the other locations to improve service performance. If the objective is to maximize the revenues of the lobby bar and the bar near the middle pool, the following factors should be taken into consideration: (See Figure 1)

- (a) Number of employees,
- (b) Space to serve customers,
- (c) Furnishings,
- (d) Customer satisfaction,
- (e) Environment,
- (f) Financing.

In case the evening entertainment shows are transferred to the platform near the pool, some of the employees from other locations in the holiday village will be moved to this place. This may in turn, cause dissatisfaction of the customers at the other locations.

On the other hand, if the employees moved to the middle pool are not sufficient, the orders from customers will not be met punctually. In order to overcome this problem, the management will be obliged to recruit new employees which will increase the labor costs. The space around the middle pool is also too small for the customers when the holiday village is full.

It is possible that it will be overcrowded and the customers will not be able to find a place to watch the entertainment shows. The middle pool does not have the capacity to contain the required number of tables, chairs, etc. in order to serve a larger number of customers because it was designed so in the beginning. Moreover, the capacity of the bar near the middle pool is also not sufficient to serve if the number of customers increase. The new open theater is going to be too close to the rooms that noise from the entertainment shows may disturb the customers who are resting. Moreover, the construction process will also destroy the nature to some extent. The problems associated with financing are the number of customers, financial risk, rate of return for the project, and technical life.

3.2. Solution of the problem by AHP

In Table 1, the comparison matrix of the factors illustrates the viewpoints of the managers. The pairwise comparison process has shown that financing is more important than all other factors. In other words, financing is seven times more important than the number of employees, three times more important than space to serve customers, six times more important than furnishings, five times more important than customer satisfaction, and eight times more important than environment. Hence, the factor "financing" has the highest relative importance with an effect of 0.470 over the maximization of the revenues of the lobby bar and the bar near the middle pool. This factor is followed by space to serve customers (0.188), customer satisfaction (0.129), furnishings (0.105), number of employees

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(0.081), and environment (0.027). The inconsistency ratio in Table 1 is 0.09. This value assures that the comparisons are consistent.

Table 1. Comparison Matrix and Relative Weights of Factors

Factors	F ₁	F ₂	F ₃	F ₄	F ₅	F ₆
F ₁	1	(2)	(3)	(2)	7	(7)
F ₂		1	2	3	5	(3)
F ₃			1	(2)	4	(6)
F ₄				1	7	(5)
F ₅					1	(8)
F ₆						1
RW	0.081	0.188	0.105	0.129	0.027	0.470
CR	0.090					

Row element is ___ times more than column element unless enclosed in ()

Factors :

F₁ : Number of employees

F₂ : Space to serve customers

F₃ : Furnishings

RW: Relative Weights

F₄:Customer satisfaction

F₅ : Environment

F₆ : Financing

CR: Inconsistency Ratio

The comparison matrices of the three alternatives with respect to the factors and the relative importance vectors of each matrix are given in Table 2. Hence, the third alternative has the highest relative importance with respect to the number of employees (0.653), space to serve customers (0.672), furnishings (0.761), and financing (0.655).

Table 2. Comparison Matrices and Relative Weights of the Decision Alternatives

1	A	B	C	F 2	A	B	C
	1	(6)	(8)		1	(5)	(9)
		1	(3)			1	(3)
			1				1
W	0.062	0.285	0.653	W	0.063	0.265	0.672
R	0.07			R	0.03		
3	A	B	C	F 4	A	B	C
	1	(2)	(9)		1	(8)	(6)
		1	(5)			1	1
			1				1
W	0.082	0.158	0.761	W	0.067	0.489	0.444
R	0.0			R	0.01		
5	A	B	C	6	A	B	C
	1	(8)	(7)		1	(7)	(9)
		1	1			1	(3)
			1				1
W	0.063	0.479	0.458	W	0.055	0.290	0.655
R	0.0			R	0.08		

Row element is ___ times more than column element unless enclosed in ()

Factors : F₁ : Number of employees, F₂ : Space to serve customers,

F₃ :Furnishings, F₄ : Customer satisfaction, F₅ : Environment, F₆ : Financing.

Decision alternatives:

A : To build a new open theater near the middle pool

B : To reorganize the present open theater

C : To reorganize the bars and their environments

RW: Relative Weights

CR: Inconsistency Ratio

This means that the reorganization of the bars and their environments requires the transfer of employees to this location from other locations. However, the number of customers coming to the lobby and the pool bar will be higher when compared with the other alternatives. In addition to this, the reorganization of the bars and their environments will result in better furnishings but, will cause an increase of expenditures in comparison to other two alternatives. On the other hand, the customers will be more satisfied and the environment will be better protected if the present open theater is reorganized. The value of inconsistency ratio for each comparison matrix is less than 0.1 meaning that the comparisons are consistent.

Finally, if the composite relative weights of the decision alternatives in Table 3 are examined, it is seen that the third alternative, which is the reorganization of the bars and their environments, has the highest composite relative weight with a value of 0.625 over the satisfaction of the overall goal. It requires the movement of employees from other locations to this location and more resources for financing, while customers are less satisfied and the environment is less protected. The alternatives "reorganization of the present open theater" and "building a new open theater near the middle pool" with composite relative weights of 0.314 and 0.062 follow this alternative. However, it must be taken into consideration that the results obtained in this study are highly dependent on the hierarchy structured and the pairwise judgements made by the managers of the holiday village.

Table 3. Composite Relative Weights of Decision Alternatives

Factors	F₁	F₂	F₃	F₄	F₅	F₆	CRW
RW	0.081	0.188	0.105	0.129	0.027	0.470	
A	0.062	0.063	0.082	0.067	0.063	0.055	0.062
B	0.285	0.265	0.158	0.489	0.479	0.290	0.314
C	0.653	0.672	0.761	0.444	0.458	0.655	0.625

Factors:

F₁ : Number of employees

F₄:Customer satisfaction

F₂ : Space to serve customers

F₅ : Environment

F₃ : Furnishings

F₆ : Financing

Decision alternatives :

A : To build a new open theater near the middle pool

B : To reorganize the present open theater

C : To reorganize the bars and their environment

RW: Relative Weights

CRW : Composite Relative Weights

4. Conclusion

In this paper, AHP has been utilized as a decision making tool to evaluate the investment alternatives in a holiday village. It is well known that measuring a service industry's output involves difficulties. Services are intangible and perishable outputs that are created and consumed simultaneously or nearly simultaneously.

The AHP, as a systematic approach that encompasses subjective criteria, alleviates the difficulties encountered in evaluating service industry operations. It assists the management in operationalizing management concepts and approaches. It also creates consensus and commitment to identify and resolve problems by coordinating participant efforts and contributing to participant satisfaction. The AHP is a useful support for managers in the decision making process. It is a comprehensive framework that facilitates overcoming the difficulties encountered in decision making.

The proposed hierarchical structure in this paper deals with a minor investment project of the holiday village. However, we propose that it is possible to extend and apply it for larger investment projects in the hospitality industry as a decision making tool through clustering.

ÖZET

Yatırım kararlarının değerlendirilmesinde finansal ölçütlerin yanında nesnel ve yarı-finansal ölçütlerin de göz önüne alınması gerekmektedir. Aksi halde, yanlış seçeneğe yatırım yapılabilir. İşte, analitik hiyerarşi yöntemi nesnel ve yarı finansal ölçütlerin de kapsam içine alındığı karar problemlerinin çözüm sürecinde etkin bir şekilde kullanılan bir yöntemdir. Bu çalışmanın amacı, ülkemizin turizm alanında önde gelen beldelerinden birinde faaliyet gösteren bir tatil köyünde yatırım seçeneklerinin analitik hiyerarşi yöntemi ile değerlendirilmesidir. Model kurma ve çözümlene süreçleri Expert Choice (Yorum 9.0) adlı karar destek yazılımı ile gerçekleştirilmiştir. İkili karşılaştırmalar matrislerindeki ikili yargılar tatil köyü yöneticisi tarafından verilmiştir. Önerilen hiyerarşik yapının geliştirilmesi olasıdır. Böylece turizm sektöründeki daha büyük yatırım seçenekleri için bir temel taşı niteliğine sahip olabilir.

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