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Research Article

Research on Estimate Index System of the Aviation Service

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Abstract: The civil aviation passenger service evaluation is a big system including airline services, airport facilities and transport. Determining the representative indexes and quantifying the interrelationships between them is a significantly important but complex challenge. Thirty six indexes were selected that involved the Ground Service, the In-flight Service and the Perception Service. Then the direct and indirect relationships were identified between these indexes. Specifically, Interpretative Structural Modeling (ISM) was used to analyze the system, after determined the reach ability matrix, decomposed the indexes into different levels, the seven levels of estimate index system of civil aviation service were established.

Keywords: Aviation service, estimate index system, interpretative structural modeling

INTRODUCTION

Civil aviation passenger service quality is an important guarantee of the civil aviation industry (Michael, 2003). A lot of researches on service quality evaluation index system are often set directly based on subjective experience (Zhang, 2009). The results of this evaluation will be subject to certain restrictions for the lack of scientific analysis.

The main purpose of this study is, by using interpretative structural modeling method, to make the judgment of the system and the relationship between the civil aviation passengers of the service evaluation, not considering the factors of the data.

ISM is a computer-assisted learning process that enables individuals or groups to develop a map of the complex relationships between the many elements involved in a complex situation.

The civil aviation passenger service evaluation system is decomposed into several sub-systems and constructs a multilevel structural model.

The estimate index system of the Aviation Service based on ISM is an algorithm-based process, depending upon their interrelationships.

Interpretative structural modeling: Interpretative structural modeling's role is to reveal the unordered and static system's internal hierarchy by the known but messy relationships between elements.
The main steps are:

- Identify the key issues of the system and select the factors that affect the key issues.
- Analyze the relationship between the key elements, establish the adjacency matrix and derive the reach ability matrix.
- Reach ability matrix is divided into a number of regions in which elements are hierarchical. Then, the extracted skeleton matrix by which structural model was created.
- Multilevel hierarchical directed graph is drawn according to the skeleton matrix.

The selection of the evaluation of the civil aviation passenger services: The contents of the evaluation of civil aviation passenger services should be travelers from buying the ticket to flying out of the sum of the entire travel of the terminal after leaving the plane until it reaches the destination, not only including airline services, airport facilities and transport should also be considered within (Myungsook and Yonghwi, 2009; Tao, 2005; Wu, 2008).

Reference to the airline passenger satisfaction theories were selected from thirty-six air passenger service evaluations, all the indicators are shown in Table 1.

Establishment of evaluation index system of aviation passenger services:
Establishment of the adjacency matrix: By analyzing the direct relations between the 36 indexes of the

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Table 1: Civil aviation passenger service evaluation index list

Serial number	Index	Serial number	Index
1	Quality of ground services	19	Information richness
2	Quality of air service	20	Information timeliness
3	Perceived service quality	21	Information query
4	Aircraft security	22	Traffic accessibility
5	Personal security	23	Service time
6	Ground security	24	Compensation rationality
7	Buying tickets convenience	25	Air quality
8	Check-in convenience	26	Seat comfortableness
9	Transit convenience	27	Space availability
10	Safety check convenience	28	Environmental cleanliness
11	Luggage claim convenience	29	Meals on board
12	Boarding and deplaning	30	Terminal facilities
13	Handling of non-normal flight	31	Airlines brand
14	Convenience of flight change	32	Punctuality rate
15	Aircraft configuration	33	Other visitors behavior
16	Route setting	34	Ticket prices
17	Flight frequency	35	Queuing time
18	Information accuracy	36	Service attitude

Table 2: Direct relationship between the 36 indexes

Index	Influencing index	Index	Influencing index	Index	Influencing index
1	7-12	13	14, 24, 32, 35, 36	25	28
2	15, 25-29	14	18-21	26	27, 34
3	4-6, 25-28, 31-36	15	16, 17, 34	27	26
4	15, 33	16	17	28	36
5	12, 15, 22	17	16, 23	29	31
6	30	18	19, 20, 32	30	22
7	14, 16-23, 31, 35	19	18, 20	31	34, 36
8	22, 30, 35	20	32	32	35
9	22, 35	21	18-20	33	35, 36
10	30, 35	22	16	34	16, 29, 31
11	30, 35	23	32	35	32, 33, 36
12	30	24	32, 34	36	31

Table 3: Reach ability matrix

Index	Influencing index	Index	Influencing index	Index	Influencing index
1	1, 7-12, 14, 16-23, 9-36	13	13, 14, 16-21, 23, 24, 29	25	16, 17, 23, 25, 28, 29, 31-36
2	2, 15-17, 23, 25-29, 31-36	14	14, 16-21, 23, 29, 31-36	26	16, 17, 23, 26, 27, 29, 31-36
3	3-6, 12, 15-17, 22, 23, 25-38	15	15-17, 23, 29, 31-36	27	16, 17, 23, 26, 27, 29, 31-36
4	4, 15-17, 23, 31-36	16	16, 17, 23, 29, 31-36	28	16, 17, 23, 28, 29, 31-36
5	5, 12, 15-17, 22, 23, 29-36	17	16, 17, 23, 29, 31-36	29	16, 17, 23, 29, 31-36
6	6, 16, 17, 22, 23, 29-36	18	16-20, 29, 31-36	30	16, 17, 22, 23, 29-36
7	7, 14, 16-23, 29, 31-35	19	16-20, 23, 29, 31-36	31	16, 17, 23, 29, 31-36
8	8, 16, 17, 22, 23, 29-36	20	16, 17, 20, 23, 29, 31-36	32	16, 17, 23, 29, 31-36
9	9, 16, 17, 22, 23, 29, 31-36	21	16-21, 23, 29, 31-36	33	16, 17, 23, 29, 31-36
10	10, 16, 17, 22, 23, 29-36	22	16, 17, 22, 23, 29, 31-36	34	16, 17, 23, 29, 31-36
11	11, 16, 17, 22, 23, 29-36	23	16, 17, 23, 29, 31-36	35	16, 17, 23, 29, 31-36
12	12, 16, 17, 22, 23, 29-36	24	16, 17, 23, 24, 29, 31-36	36	16, 17, 23, 29, 31-36

system, direct relationship table can be obtained, as shown in Table 2.

Adjacency matrix is established, that shows a binary relation between the evaluation indexes, namely the relationship between each two nodes.

The adjacency element α_{ij} can be 1 when s_i affects the s_j, otherwise its value is 0.

Establishment of the reach ability matrix: Reach ability matrix can be obtained with adjacency matrix and the identity matrix.

When there is a natural number k that makes:

$$(A+I)^{k-1} \neq (A+I)^k = (A+I)^{k+1} = M$$

is founded.

For its reach ability matrix is 36-order matrix, it is transformed into a table including all direct and indirect relations, as shown in Table 3.

Regional breakdown the hierarchy division: According to its accessibility index set, leading index set and common set, the initial set (the intersection of leading index set and common set) is an empty set. Thus, it is regional inseparable, namely there is only one region.

Hierarchy Division can determine the indicators' position in the region. The basic approach is to identify and remove the most advanced indicators (the termination set) in the index set and then seek the most senior of the remaining index set and so on, until the minimum level is determined. Table 4 is the result.

Table 4: Hierarchy division

Hierarchy	Influencing index
1	1, 2, 3, 13
2	4, 5, 6, 7, 8, 9, 10, 11, 24, 25, 26, 27
3	12, 14, 15, 28
4	21, 30
5	18, 19, 22
6	20
7	16, 17, 23, 29, 31, 32, 33, 34, 35, 36

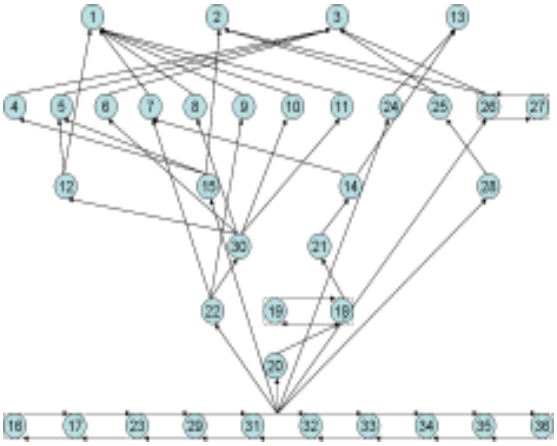

Fig. 1: Civil aviation passenger service evaluation system

Extract skeleton matrix: Skeleton matrix extraction is Hierarchy Division matrix, a total of three steps:

- **Eliminate the strong connection elements:** Strong connection elements sets are simplified by retain an indicator of the set, such as $\{s_{18}, s_{19}\}$ $\{s_{26}, s_{27}\}$ and $\{s_{16}, s_{17}, s_{23}, s_{29}, s_{31}, s_{32}, s_{33}, s_{34}, s_{35}, s_{36}\}$ can be reduced to $\{s_{18}\}$, $\{s_{26}\}$ and $\{s_{16}\}$.
- **Eliminate skip-level relations can be replaced by step-binary relations:** For example, skip-level relations (s_{16}, s_{22}) can be replaced by step-binary relations (s_{16}, s_{20}) and (s_{20}, s_{22}).
- **Eliminate binary relation between two same indexes:** Elements '1' on the main diagonal change to "0", as a result, the simplified skeleton matrix with the minimum number of binary relations is obtained.

Establish multilevel hierarchical diagram: A multilevel hierarchical digraph is drawn according to skeleton matrix that is the hierarchical structure model of the system indicators. Process is mainly the following three steps:

- The indexes are arranged progressively in the system constitute from top to bottom, in accordance with the number of each level and some indicators.
- Join the strong connection deleted at the same level, such as s_{27}, s_{19}, s_{17} etc., as well as the arc indicates their relationship.
- Using arcs, all adjacent binary relations between grades are marked to form the multilevel hierarchical diagram shown in Fig. 1 that is the civil aviation passenger service evaluation system.

CONCLUSION

It can be seen from Fig. 1 that all the indicators in the evaluation system can affect the index 1, 2, 3 and 13. Thus, the primary consideration to improve the quality of civil aviation passenger services is to improve its ground services, air services, aware services and non-normal flight services quality.

It will make travelers more satisfied if it focuses on improving the comfort, safety and convenience issues under the premise to ensure these indicators.

At the same time, due to the bottom of the evaluation system is the most fundamental reason, the airline authorities must improve the quality of service, forge the brand advantages, achieve price superiority, enhance the efficiency service and optimize route in order to make their enterprise more competitive.

REFERENCES

Michael, J.M., 2003.Competition and service quality in the U.S airline industry. Rev. Ind. Organ., 22: 275-296.

Myungsook, A. and N. Yonghwi, 2009. Airline customer satisfaction and loyalty: Impact of in-flight service quality. Serv. Bus., 3: 293-307.

Tao, P., 2005. Airport passenger ground level of service evaluation system. China Inform. Technol., 7: 93-95.

Wu, H., 2008. Civil aviation passenger service product evaluation. Comm. Ind., 20: 38-39.

Zhang, L., 2009. Airline services and service quality evaluation. Vitality Enterp., 5: 35-37.