

## **Ranking the technical requirements of the airport for maximum passenger satisfaction**

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**Abstract:** Airport service quality is crucial due to the increasing traveling with plane, nowadays. There are some studies on the passengers satisfaction in literature. But lots of them are related to determine the passengers' needs and expectations and their importance levels.

This paper presents the service quality approach for ranking the technical requirements that meet passengers' needs and expectations for the Anadolu University Airport in Turkey. Firstly the service quality is measured with the questionnaire. Questionnaire is organized to collect the passenger's both expectations and perceptions, and is evaluated by using SERVQUAL model. Then, Quality Function Deployment (QFD) approach is used for setting the relationships between the passenger requirements and the technical requirements, and between technical requirements of the airport. Finally, the technical requirements are ranking with the calculation method for the maximum passenger satisfaction.

**Keywords:** Service Quality of the Airport, Servqual Model, Quality Function Deployment

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### **1. Introduction**

In today's raising travel around the world, travel with plane is one of the most preferred traveling types. So, passenger satisfaction is the curricule topic for the airport management. Several authors mentioned the importance of passenger satisfaction like as follows:

“Passenger satisfaction is a key performance indicator for the operation of an airport. International airports located at different regions or countries by and large do not compete with one another. Passengers often do not have a choice between airports regardless of price and quality levels of airport services. In other words, passenger demand for airport services is likely to be relatively inelastic” (Doganis, 1992).

“The airport industry is changing rapidly. Today’s air travelers have meaningful choices among airports and there is an increasing urgency among airport marketers to differentiate themselves by meeting the needs of customers better than the competition. While passengers’ perception of airport service quality is only one of several variables (e.g. routes, scheduling, location and prices) that contribute to overall airport attractiveness, it is nevertheless an important variable because of the increasing importance of a customer orientation to competitive advantage in this industry” (Fodness & Murray, 2007).

Fodness and Murray proposed a model on service quality in airports by using passenger expectations was combined with the qualitative research. Quantitative research was used to develop a self-report scale to measure passenger expectations of airport service quality, to test dimensionality and to evaluate scale reliability and validity (Fodness & Murray, 2007). The personal experiences and expectation from passenger helped to find the qualitative attributes. This conceptual model created by passenger experience and the relevant literatures. The airport service quality expectations consist of three sub dimensions namely servicescape, service personnel, and services in the re-specified model. Servicescape include layout & function, signs and symbols, and ambient conditions. Service personnel dimensions consist of the service provider’s problem solving behavior. The last dimensions “Service” criteria include a short waiting time, flight delay and cancellations due to security, breakdowns and weather conditions, maintenance which are interested in productivity. The data collected from frequent flyer. He re-structured the model after making factor analysis that are: function (effectiveness and efficiency), interaction (access, problem solving, advice) and diversion (maintenance, ambiance, décor, productivity) (Fodness & Murray, 2007).

Chen (2002) built the benchmarking process from the voice of customers at Chaing Kai Shek International Airport (CKS). He proposed a methodology called the quality benchmarking deployment for prioritized design attributes by considering the relationships between customer needs and design attributes. Benchmarking is applied several airport and results are considered to determine the improvement areas. For data collection, face to face interview with the passengers, civil aviation departments, forwarding agents aviation experts, and management scholars is used. The “convenience of transport facilities connecting to the outside”, “interior design and layout of building, “sufficiency of stops and lights of flights” and “information service of the airport” were selected first priorities to be benchmarked by the CKS airport.

Humphreys et al. (2002) has reviewed current practice in performance measurement of airports. According this study, the performance measurement can be divided into three main categories which named by business measures, service measures, and environmental measures. If the service measure examine in detailed, it has shown that these measures handled with two categories: objective and subjective criteria for improving the service performance. Service measures based on the subjective perception of service quality include signage/user friendliness of terminal, cleanliness of terminal, cleanliness of restrooms, check-in satisfaction, catering overall satisfaction, value for money in the shops, baggage delivery overall satisfaction, availability of baggage trolleys, and overall standards of car park facilities. Objective measures included response time to customer, comment cards, check-in waiting time, security check waiting time, baggage delivery time, taxi waiting time, and punctuality/delayed flight departures attributable to the airport (percentage over a certain time/total departing flights).

Yeh and Kou (2003) developed a new fuzzy multiattribute evaluation model with an effective algorithm to obtain an overall service performance index for each of Asia-Pacific's 14 major international airports, based on multiple passenger service attributes. This algorithm allows the decision maker's confidence level and preference attitude on respondent's fuzzy assessments to be incorporated into the evaluation process. In the survey process, the linguistic terms were used to express the subjectiveness, and each of term is characterized by a triangular fuzzy number. Service attributes were named by "comfort", "processing time", "convenience", "courtesy of staff", "information visibility", and "security". Also, the service performance index is calculated to obtain the comparative quality level of passenger services among airports evaluated. This index provides the information for the airport management to identify functional areas for service improvement.

Fernandes and Rodrigues (2010) evaluated the airport service quality using fuzzy multicriteria analysis and the alpha-cut concept. It was applied to six Brazilian international airports. They decided to constitute of fuzzy indicators for the three levels of management: operating, tactical and strategic. They present two analytical tools to the airport management. The first tool is the quality approach extremely relevant to discussing strategic management of organizations, and the second is consolidating as a tool for multicriteria analysis. This study gives to the managers a view of comparative perceptions of quality among the airports by presenting the analysis in fuzzy form and assist to manager new style of evaluation.

In this study, the expectation and the perception of the passenger at the Anadolu University Airport in Turkey are investigated with the questionnaire and analyzed the gap between them by the SERVQUAL model. After that, passengers satisfactions criteria are classified and handled as a WHAT part of the first house of QFD. Gap values are used the importance levels of passengers satisfactions. Then technical requirements (HOW's of the QFD) are determined to meet to the passenger's needs and expectations, and the relationships between them are determined by QFD team. Finally, the technical requirements are weighted and ranked by considering these relations.

In second section gives the methodology which includes SERVQUAL model and QFD approach, respectively. The application and the results are given in the third section. The fourth section includes the conclusion.

## 2. Methodology

The methodology are proposed for ranking the technical requirements of the airport by considering passenger requirements are by using SERVQUAL model and QFD approach, respectively. The aim of this methodology is to integrate the SERVQUAL model and QFD approach to develop service quality for the airport. The steps of the methodology are given as follows:

**STEP 1: *Designing the questionnaire:*** Questionnaire is designed according to the SERVQUAL model that includes both passenger expectations and perceptions. Questions are classified with six groups by considering the related topics. Then questionnaire is applied on the local airport customers by face to face. The questionnaire was divided into two parts, the first part include the questions were related to the demographic features, the second part was designed to measure the passengers' perceptions and expectations regarding service quality of airport industry.

**STEP 2: *Analyzing the questionnaire and handling the SERVQUAL scores:*** Questionnaire is analyzed by using several statistical methods and handled the gaps between passenger expectations and perceptions for each customer requirements and for the classified requirements.

**STEP 3: *Connection the results of the SERVQUAL model and QFD approach:*** These passenger expectations and perceptions and their gap scores (perception mean – expectation mean) for each attributes are used as the customer requirements and their importance levels of the first house of QFD.

**STEP 4: *Determining the technical requirements and constructing the***

**relationship matrix:** The technical requirements and the relationships between passenger requirements and technical requirements are determined with the member of the QFD team that include the management and technical persons of the airport according to the passenger requirements and the rules of the QFD by using brainstorming techniques. This information is assigned in the “HOWS” section of the QFD house.

**STEP 5: Ranking the technical requirements of the airport:** The technical requirements are weighted by multiplying the importance levels for each attribute and the value in the relationship matrix and summing them by row. Also, these weights are normalized and located at the bottom of the relationship matrix.

## 2.1. Servqual Model

The SERVQUAL model was developed by Parasuraman, Zeithaml and Berry in 1985 for measuring service quality. It was applied a broad range of service organization. At first, Servqual scale is presented as a multidimensional structure. Parasuraman et al. (1985) identified ten components of SERVQUAL: reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding/knowing the customer, tangible with 97 items. Then, they clarified this ten dimensions into five dimensions (Parasuraman, Zeithaml, & Berry, 1988) named as reliability, tangibles, responsiveness, assurance and empathy with 22 –items to measure service quality. The resultant five dimensions and their definitions were:

- 1- Tangibles.** The appearance of physical facilities, equipment, personnel, and communication materials
- 2- Reliability.** The ability to perform the promised service dependably and accurately.
- 3- Responsiveness.** The willingness to help customers and provide prompt service.
- 4- Assurance.** The knowledge and courtesy of employees and their ability to convey trust and confidence.
- 5- Empathy.** The caring, individualized attention provided to customer (Parasuraman, Zeithaml, & Berry, 1988).

Servqual model consist of two parts; a perception part containing 22 items to measure a personal customer assessment within the service category, an expectations part containing 22 items to measure the general expectations of customers related in a service. To calculate this statement was used a seven-point Likert scale (Zeithaml, Parasuraman, & Berry, 1990). Servqual measures

the gap between customer perception and expectation. Service quality is calculated as the difference in these two scores. Positive gap (Expectation Mean > Perception Mean) score indicates better service quality taken from the product or service consumed while negative score (Perception Mean > Expectation Mean) indicates inadequate service and poor quality. Zero score means that the quality is satisfactory.

## **2.2. The Quality Function Deployment Model (QFD)**

Quality Function is defined as the collection of activities and “deployment” is the new word, which means to a broadening of activities. By integrating these two words, “Quality Function Deployment” means that responsibility for producing a quality item (Hebbar & Jnanesh, 2008). Quality Function Deployment was introduced by Akao (Akao, 1990). QFD method starts with the customer demand for planning product and services, then, converting the customer’s demand into design targets and major quality assurance point to be used throughout the production phase. This method is an approach of taking customer demand into design attributes. QFD is applied in a wide variety of services industries, customer production, retail sales operations, educations system, military needs, retail sales production, airline industry, healthy care.

QFD has traditionally been known as four linked house, the first house is most widely used in literature and in industry. The name of the first house is the House of Quality (HOQ) which was defined the basic calculation concept by Hauser and Clausing study (Hauser & Clausing, 1988). The House of Quality begins with the customer requirements. The customer attributes has the relative importance weight taken from the experience with customers or on surveys. QFD design team list engineering characteristics that are likely to relate one and more of customer attributes. Then, technical requirements or engineering characteristics is linked with the customers attributes by using the number of establish the strength of relationships. This linked part is named “relationship matrix” show how much engineering characteristic affects each customer attribute. After that finding the relationship of them, adds objective measures at the bottom of the house. Upper part of the Quality House constitute of the relationship the engineering features named as the roof matrix (Hauser & Clausing, 1988).

## **3. Application and Results**

### **STEP 1: *Designing the questionnaire:***

Developed questionnaire are arranged according to the dimensions of

servquals. The tool for measuring the airport quality derived from 6 dimensions named by “terminal facilities”, “personnel”, “accessibility”, “responsiveness”, “easy access to service”, and “assurance”. Servqual dimensions (Parasuraman, Zeithaml, & Berry, 1988) are modified as regarding of the airport service quality features. The first dimension Tangible was divided to three parts named as a “terminal facilities, “personnel” and “accessibility”. Empathy dimension is also covered in “responsiveness”. It was added new dimensions “easy access to service”. An adapted version of Servqual dimensions use for passenger service evaluation given Table 1. This six modified dimensions include 30 service quality attributes developed by the airport expert and the review of the past literature.

Table 1: An adapted version of Servqual dimensions.

Service attributes	Performance Measures
Terminal Facilities	Overall physical appearance of terminal, the needs of terminal building, the ability of terminal facility
Personnel	The appearances of personnel
Accessibility	The ability provide easy and convenient access in terminal facilities and city central
Responsiveness	Willing to help customer, understand their needs properly
Easy Access to Service	The efficiency of process times
Assurance	The ability of building and knowledgeable of personnel feel safe in terminal , security and trust

The questionnaire is a restructure of the original Servqual model in order to fit the airport industry. 30 items- questionnaires include airport service quality dimensions consistent with the Servqual dimensions. Questions addressing perceptions and expectations were rated by using 5-point Likert scale. The scale is conducted as 1 = unimportant, 2 = little importance, 3 = moderately important, 4= important, and 5=very important. For purpose of data analyses and hypothesis testing, SPSS 16.00 was used.

The local international airport placed in the middle- part of the Turkey, was chosen as an application. This airport passenger can reach only 2 countries that are Istanbul in Turkey, Belgium and other countries with connecting flights from Istanbul. In terms of destination, the most popular is Belgium, especially in summer days. The survey was carrying out during the one month in 2011 at May-June. It was targeted the passengers who used the airport at least one times and more. The questionnaire was made face to face with 150 passenger waited in lounge and 135 passengers’ questionnaire was applied correctly. The participation was voluntary. The response rate was almost % 90. The questionnaire was examined by passenger at the lounge and their contributions were collected. The questionnaire was initially tested by 30 passengers. After

re-designed of questionnaire, the reliability (Cronbach's alpha were 0.873 for expectations and 0.885 for perceptions) was suitable. It was also calculated each dimensions reliability. According the reliability result, the content validity of survey was viewed adequate (see Table 2).

Table 2: Reliability Result.

Service Quality Dimensions	Expectation Cronbach Alpha	Perception Cronbach Alpha
Total	0,873	0,885
Terminal Facilities	0,771	0,726
Personnel	0,910	0,872
Accessibility	0,742	0,814
Responsiveness	0,919	0,911
Easy Access to Service	0,886	0,784
Assurance	0,851	0,844

**STEP 2: Analyzing the questionnaire and handling the SERVQUAL scores:**

According to the analyses of demographics, the gender distributions were %36.3 female and %63.7 male. The majority of respondents were Turkish (%86.7) and Other Nationality (%13.3). The passengers (%48.9) traveled to Istanbul, Belgium (% 43.7) and Other destination (connection flights) (%7.3).

Descriptive statistical methods were used this study. The means, standard deviations, the difference were computed for each attributes. The Servqual score (PM-EM) for each customer needs was calculated by the difference between perception means – expectation means. Table 2 show means, standard deviation and Servqual score for each passenger attributes. According to Table 2, all of the attributes indicate negative service quality gaps which means of an inadequate service quality. In accordance with the results of the study, the customer attributes with the first two high expectations and perceptions scores were Q30- To Feel safe and peaceful at the airport and Q29-Small number of damage and baggage loss. The larger gaps scores were, Q9-Availability of flight information display (-2.2889); Q5- Variety and number of shopping stores (-2.2518) ; Q7- Availability of ATM cash machine and exchange office (-2.2148); Q10-Availability of call/internet service to reply passenger desire and problems. All of the larger gaps are contained within the "Terminal Facilities" dimensions. This result shows that the passengers expected a higher level of service with the "Terminal Facilities".

Table 3 : Servqual score for each questions

Dimensions	Questions	Customer Attributes	Mean.(P)	SD.(P)	Mean.(E)	SD.(E)	Gaps(PM-EM)
Terminal Facilities	Q1	Sufficient size of terminal	2,5481	0,82605	3,6815	0,82545	-1,1334
	Q2	Modern terminal	2,6444	0,7478	3,9704	0,69045	-1,326
	Q3	Providing enough seat in the waiting room	2,6667	0,74313	3,9111	0,73775	-1,2444
	Q4	Having adequate ventilation and heating system	3,2963	0,91484	4,0593	0,65521	-0,763
	Q5	Variety and number of shopping stores	1,5852	0,69524	3,837	0,7937	-2,2518
	Q6	Convenient of shopping store prices	1,8741	0,893	3,963	0,79558	-2,0889
	Q7	Available of ATM cash machine and Exchange Office	1,7556	0,91803	3,9704	0,82806	-2,2148
	Q8	Efficiently Announcement	3,2222	0,96712	4,0963	0,70047	-0,8741
	Q9	Available of flight information display	1,8889	0,85227	4,1778	0,70039	-2,2889
	Q10	Available of call/internet service to reply passenger desire and problem	1,9407	0,84432	4,0889	0,72757	-2,1482
	Q11	Available of Internet	2,0074	0,89356	3,8519	0,8597	-1,8445
	Q12	Available / Cleanness of the toilets	3,8444	0,79049	4,2	0,64415	-0,3556
Personnel	Q13	Neat and tidy employees (as uniforms and personal)	3,7333	0,79363	4,1037	0,68321	-0,3704
	Q14	Courtesy/Helpfulness of the employees	3,7778	0,8073	4,163	0,66025	-0,3852
	Q15	Friendly employees	3,7111	0,83636	4,2074	0,71337	-0,4963
Accessibility	Q16	Efficiently labels and symbols to help passenger	2,6222	0,87132	4,2	0,68893	-1,5778
	Q17	Sufficient parking capabilities	3,2444	0,88492	4,0889	0,69612	-0,8445
	Q18	Available of baggage trolleys	3,5185	0,85389	4,0222	0,69612	-0,5037
	Q19	Easy access to baggage claim area after landing off	3,4815	0,93722	4,1926	0,61688	-0,7111
	Q20	Easy and convenient access between city and airport	2,9704	1,02899	4,2593	0,63438	-1,2889
Responsiveness	Q21	Employees willing to help passenger	3,4667	0,92881	4,0148	0,84628	-0,5481
	Q22	Requests and complains are responded immediately by employees	3,5111	0,91314	4,0296	0,76237	-0,5185
Easy Access To Service	Q23	Short waiting time of security department	3,4667	0,86214	4,2296	0,59777	-0,7629
	Q24	Short waiting time of check-in department	3,4667	0,78986	4,1556	0,62135	-0,6889
	Q25	Short waiting time of passport control	3,0741	0,98215	4,2667	0,57562	-1,1926
	Q26	Efficient baggage handling services	3,4296	0,93474	4,2519	0,6074	-0,8223

Gaps means (Servqual score) of each dimension was given by Table 3. It revealed that "Terminal Facilities" (-1.544) has the highest gap mean while the "Assurance" has the minimum gaps mean (-0.4099). According to the results,

airport management must be developed firstly terminal facilities needs. At the end, the overall Servqual scores for service quality is found as -0.7921.

Paired t-test was set to investigate whether there are any significant differences between overall means for the six quality dimensions.

#### Hypotheses

$$H_{01}: \mu_D = 0$$

$$H_{11}: \mu_D \neq 0$$

The results of test are given in Table 3 and evaluated with a % 5 significant level. P-values in Table 4 are smaller than the significant level ( $p \text{ value} = 0.00 < \alpha = 0.5$ ),  $H_{01}$  is rejected, there is a significant differences between expectation and perception means for all dimensions.

Table 4: Servqual Score of each dimension.

Factors	Perceptio n Mean	Expectati on Mean	Gaps Mean	t- Test	p-value
Terminal Facilities	2,43	3,99	-1,544	31,456	0,000
Personnel	3,74	4,16	-0,4173	5,202	0,000
Accessibility	3,16	4,15	-0,9853	16,082	0,000
Responsiveness	3,48	4,02	-0,5333	5,541	0,000
Easy Access to Service	3,35	4,22	-0,8666	10,661	0,000
Assurance	3,90	4,31	-0,4099	6,001	0,000

### **STEP 3: Connection the results of the SERVQUAL model and QFD approach:**

The connection of SERVQUAL model and QFD approach is obtained by the House of Quality. House of Quality (HoQ) is the first house of QFD. He customer needs and expectations are handled on the left column (“Why’s section”) of the HoQ. In the service quality of airport studies, passengers’ needs and expectations are set on the Why’s section of the HoQ.

The importance levels of passengers’ needs also were got from questionnaire with 5-scale Likert. The importance and satisfaction level was assigned by the Gaps (Perception mean-Expectation Mean) of each passengers’ needs and expectations.

### **STEP 4: Determining the technical requirements and constructing the relationship matrix:**

The technical requirements for the airport service are determined by brainstorming are carried out the member of the QFD team that include the manager and technical person of the airport. They were assigned in the “Hows” section of House of Quality.

Each of passenger needs is related individually to the at least one technical requirement. The QFD team evaluated the relationship between passengers’



Table 5: House of Quality for servis quality of the airport.

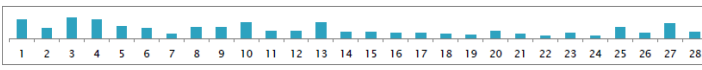
Technical Requirements		Customer Needs		Importance Level (Servqual Score)																											
				The number of flight information board	Souvenir and gift shop	The number of restaurants and cafes	The Number of shopping center	Capacit of Wi-fi	The number of exchange office	The number of ATM	Presence of web site	The number of emergency phone	SMS information service	Periodic cleaning	WC Floor and renewal of vehicles	The number of signboard	Renewal of floor and wall tiles (table,chairs,...)	Seating Capacity	Expand of terminal area	Sound installation layout	General ventilation system	The number of passport and visa controller	Car parking capacity	Baggage Trolley	Periodic arrival time of buses	Enlarging the windows	The number of technical training	The number of passenger behavior training	Number of passenger service vehicles	Emergency Button and otomation system	
Terminal Facilities	Sufficient size of terminal	2.29	9																												
	Modern terminal	2.25		9	9	9																									
	Providing enough seat in the waiting room	2.21																													
	Having adequate ventilation and heating system	2.15					3			9	9	9																			
	Variety and number of shopping stores	2.09			9	9																									
	Convenient of shopping store prices	1.84					9																								
	Available of ATM cash machine and Exchange Office	1.33	3	1	3		1	1	1	3		9	9	9	9	9						1			3			9	9		
	Efficiently Announcement	1.24															9														
	Available of flight information display	1.13																9													
	Available of call/internet service to	0.87																	9												
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Personnel	Available / Cleanness of the toilets	0.36										9	9													3					
	Neat and tidy employees (as uniforms and personal)	0.50																									3				
	Courtesy/Helpfulness of the employees	0.39																									9				
Accessibility	Friendly employees	0.37																									3				
	Efficiently labels and semboles to help passenger	1.58	9											9																	
	Sufficient parking capabilities	1.29																						9				9			
	Available of baggage trolleys	0.84																				9						9			
	Easy access to baggage claim area after landing off	0.71												9							3										
	Easy and convenient access between city and airport	0.50																					9								
Responsiveness	Employees willing to help passenger	0.55																								3	3				
	Requests and complains are responded immediatly by employees	0.52																									3				
Easy Access To Service	Short waiting time of security department	1.19																			9										
	Short waiting time of check-in department	0.82																			3					9					
	Short waiting time of passport control	0.76																								3					
Assurance	Efficient baggage handling services	0.69																									3				
	Behaviour of employees give passengers confidence	0.44																									3	3			
	Passenger get satisfactory responses from employees to their	0.40																								9	3				
	Small number of damage and baggage loss	0.40									9	3																	3		
	To feel safe and peaceful at the airport	0.39																								9					
Relative Importance		520.86	38.78	21.59	43.04	39.07	24.37	21.26	7.97	23.31	22.93	32.47	15.13	15.13	32.53	11.93	11.93	11.20	10.20	7.87	6.87	15.33	8.93	4.53	11.60	3.98	22.85	11.78	31.13	13.13	
Relative Importance (%)		100	7.45	4.15	8.26	7.50	4.68	4.08	1.53	4.48	4.40	6.23	2.91	2.91	6.25	2.29	2.29	2.15	1.96	1.51	1.32	2.94	1.71	0.87	2.23	0.76	4.39	2.26	5.98	2.52	
																															

Table 6: Ranking of the technical attributes according to their weights ( First 10 passengers' needs)

Ranking order	Technical requirements
1	The number of the restaurant and cafes
2	The number of shopping center
3	The number of flight information board
4	The number of signboard
5	SMS information service
6	The number of passenger service vehicle
7	Capacity of wi-fi
8	Presence of web-site
9	The number of emergency phone
10	The number of technical training

According to the relative weights, the number of restaurants and cafes, the number of flight information board, the number of shopping center, and the number of signboard have greater priority more than others in this case. Therefore, this airport should consider the airport design projects. This information can help the airport experts to improve the service design projects. It can be developed by adding news target value as a technical difficulty and costs.

## 4. Conclusion

Airport population has increased day by day. The service quality becomes a primary goal of all airports. The airport management endeavor to improve a passenger satisfaction. To evaluate of service quality focused on the passenger expectations (needs) .This study has attempted to develop a conceptual service quality approach for the airport services.

Proposed "Service Quality Approach" is connected with Servqual and House of Quality to determine the weights of technical requirements. Also, airport managers can reach easily which improvements should be made for the maximum passengers satisfaction.

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