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Quality Evaluation in Health Sector: A Case Study

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ABSTRACT : *In today's competitive market one of the most emerging service industry is health sector. The reputation of health care organization depends on its commitment to quality and patient centered services which are the main criteria for customers for choosing a healthcare service provider. Thus the increasing importance of patient experience in relationship with the various dimensions of healthcare services quality becomes an important domain of study. The Purpose of this study is to identify and evaluate the different factors which effect the patient satisfaction in health care centers or hospitals. In addition, the study have also considered the views of employees of the hospital as a stakeholders of healthcare services. This study has been conducted in KIMS hospital, Bhubaneswar, Odisha, India. Response from patients from different departments are collected and analyzed using gap analysis and neural network. The findings suggest that patient experience was significantly associated with the health care system. Some areas need more attention for continuous improvement of quality in the hospital. Further, in this study, different gap models are tested using neural networks. The result shows that the P-E service model as far as the health service quality is concerned. The gap analysis for employees also suggest some areas that have to be looked into for continuous improvement of health service quality.*

KEYWORDS: *Service Quality, Healthcare, Gap Analysis, Neural Network*

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I. INTRODUCTION

The health care industry is making rapid progress now a day sand the competition among the health care services provider is also increased, due to the numerous challenges related to quality of healthcare. Customer satisfaction is the key element in every industry for profit ability and sustain ability and this is also applicable for the healthcare service. Over the last few years, the issue of patient/customer satisfaction has gained attention in health care services. Due to this, service providers are trying to improve customer satisfaction through various initiative. But the evidence are enough to conclude that more work in this field is needed. There are different factors which affect the customer satisfaction in India. Some of the factors are qualities of basic amenities, doctors attention and behavior and family access. But beside these factors there are some other factors also which can create sense of dissatisfaction, as patient look for the facilities that are more favorable to them. Customers also compare the health care service they get from one hospital to another and evaluate the performance by the service which are derived by the doctors and the improvement in the their health. But besides these variable, the most important link between the patient and hospital is the doctor. The degree of perception of the patients mostly depends on the attitude and the treatment that patient receive from the doctors, nurses and other healthcare professional. In this study an attempt has been made to evaluate the various factors that affect the patient's expectations and satisfactions in hospitals. This case study has been conducted in KIMS hospital, Bhubaneswar, Odisha, India. Response from patients in five departments such as medicine, orthopedics, etc. are collected and analyzed using gap analysis and neural network. The findings suggest that patient experience was significantly associated with the health care system. The areas such as Availability of the doctor on time, Understanding the specific needs of the patient, Quality and variety of the food for patients, etc. require more attention in order to improve quality in the hospital. Further, the P-E service model which shows the best model is at par with the SERVQUAL model which is largely accepted quality model. The gap analysis of employees

shows that factors such as Staffs are afraid to ask questions when something they doesn't feel right , The pay scale is satisfactory, The management considers staff suggestion in matters regarding the betterment of hospital, etc. have to be looked into for continuous improvement of health service quality.

II. SERVICE QUALITY IN HEALTHCARE

In the last decades the concepts of service quality and customer satisfaction have also received increasing attention in the healthcare industry. However, because the health care industry has its own specific traits, its attitude towards clients and service quality differs somewhat to the attitude in other industries. In addition to certain specific circumstances determined by the health care system in which organizations operate in different countries, differences are evident in terms of health care products and healthcare consumers. First of all, the products and services that make up the health care products are unique and patients perceive the mas a complex mix of services. Therefore, it is difficult to define and measure their quality. They are characterized by a lack of substitution, and health care organizations often provide only one type of service for a particular need. A big difference compared with other sectors is evident in defining the consumer. At the broadest level, all people represent a potential market for health care products. Sooner or later everyone will need a particular medical service or product. However, until recently it was considered that the consumers of health services were only sick people but after the 1990s" the emphasis shifted from sick people to well people"[1].Motives that encourage people to address health care institutions are diagnosis, prevention and treatment of disease, but also a desire to enhance well-being or quality of life. The new generation of health care consumers, such as patients, family of patients and potential consumers, demands improved quality of service, increased satisfaction, medical error reduction, and prevention of diseases[2]. Therefore, in the present circumstances, more attention should be paid to service quality and customer satisfaction. Quality in health care can be understood as technical or outcome quality and functional or process quality[3].While technical quality primarily focuses on what consumers actually receive from the service, functional quality is focused on the process of service delivery. Thus, technical or clinical quality is considered as the accuracy of diagnoses and procedures according to the professionals' specifications, and functional quality as the way in which the service is delivered to the patient[4].However, it is also evident from the literature that healthcare quality is not only defined in terms of clinical quality, instead, special attention should be paid to delivering service quality in terms of appropriate communication between staff and patients. Since there is consensus among scientists that the evaluation of service quality is based on the subjective judgment, it is considered as ap propriate to define service quality as the difference between customer expectations of service and perceived service. Thus, from the patient's perspective, service quality includes perceptions of medical care, but also such seemingly peripheral concerns as physical facilities, and interactions with both medical and para medical staff. The quality of health services is often measured by the widely accepted SERVQUAL model [5, 6, 7, 8, 9,10, 11].Health care service quality research, using the SERVQUAL model, brings mixed results. Some have found SERVQUAL are liable instrument, while others suggest there are certain health care service dimensions that are not captured by the SERVQUAL scale [5, 12, 13, 14]. Therefore, it is important to tailor the SERVQUAL scale to a sector's specific needs, culture or nation. It was suggested that the survey instrument needed to be customized for use in the specific industry to which it was being applied by including additional related questions [15]. Although the scale has been modified and tested in several health care environments, most research was conducted in developed western societies. Neural networks is used my some authors to evaluate the degree of perceptions of customers in healthcare industries [16, 17, 18].

III. RESEARCH DESIGN

This pilot study investigates patients' expectations and perceptions in the health care industry has been carried out in KIMS Bhubaneswar. The purpose of this study is to assess the impact of service quality on customer satisfaction in the health care sector. For this purpose, the objectives are defined as follows: (a) to determine patients' expectations regarding service quality at the hospital;(b) to assess patients' perceptions of the service quality; (c) to establish the gap between expected and perceived service quality; (d) to determine the relationship between perceived service quality dimensions and overall customer satisfaction in the case of specialty hospital; and (e)to assess the impact of overall customer satisfaction on customer loyalty in the health care context.

The questionnaire was designed to gather empirical data from patients. Customer expectations and perceptions regarding health care services in the specialty hospital were examined using a modified SERVQUAL model for measuring service quality [12,13].There search instrument consisted of two parts. The first part of the questionnaire included 17items relating to the patients' expectations regarding hospital services. The second part consisted of 10 items measuring the perceived health care service quality by the employees. Respondents evaluated their agreement with statements on a five- point Liker t-type scale ranging from1"strongly disagree" to

5"strongly agree". The questionnaires were distributed to the patients upon check-in. Completed questionnaires were collected during check-out from patients who used the medical and accommodation services of the hospital. A total of 100 questionnaires were distributed. Data was collected during January and March of 2015.Of 42 returned questionnaires, two were in complete and excluded from further analysis. Thus, data analysis is based on a sample of 40 valid questionnaires representing a response rate of40%.Similarly, for employees we got 29 response were received out of 35 which is about 82%. The detail questionnaire are given in appendix 1.

Design of Models

Human decision-making process can be modeled using neural networks as it has the capability to predict an output, classify a given set of inputs into different groups (known as the pattern recognition), and incorporate heuristic criteria [17]. As neural network can effectively exploit and represent the non-linear relationship between the consumer satisfaction and their perception of the service, it can be used for modeling of a customer's decision making [19].

Usually, four models such as perception minus expectation gap (P-E gap), expectation minus perception gap (E-P gap), perception-only (P-only), and expectation and perception (E&P) models are used to predict service quality. However, performance of various models in relation to predictive power of service improvement widely differs depending on to specific application [12, 13, 14, 16]. The diverse components of service sector make its quality control and improvement more difficult to generalize. The service quality items in the educational sector largely differ that from the auto-dealer network, financial or transportation sector or healthcare . Thus, neural network models, when tested in a different service sector with different survey items, may indicate significantly different results. Therefore, in this work, four neural networks models have been designed for the analysis and evaluation of service quality in healthcare with the input data such as customer expectations, perceptions and the gaps.

Model-I (P-E gap model)

In this network model, the input is defined using the traditional SERVQUAL-based gap that means perceptions of customers minus the expectations [12].

Model-II (P-only model)

The use of perception and expectation gap raised concern among the researchers due to its low reliability and poor inter-factor correlations [14]. It is argued that perceptions of the customer are more important than the gap between their perceptions and expectations. Therefore, a service quality measuring instrument known as 'SEVPERF' considering only the perceptions of the customers.

Model-III (E-P gap model)

Generally, it is assumed that most customers enter a service situation with some expectations [16]. These expectations are formed either by previous experiences of the same or similar service, or simply expectations generated by customer independently. So customer usually undertakes a service experience with some preconceived expectations and thereafter develops a perception of that experience. Hence, service quality could be measured as expectations minus perceptions or E-P gap. A positive E-P score implies that customer expectations are more than the perceptions of the customer i.e. the expectations of customers are not met whereas a negative score in this gap indicates the delighted customer.

Model-IV (E & P model)

Customer expectations are generally accepted as a part of the service experience but their exact role in the overall evaluation of service quality is still controversial [16]. Therefore, the interactions of expectations and perceptions independently may be considered without a predefined relationship between them.

Using the training sample (75% data), the network is run till root mean square error (RMSE) is minimised. Then, the network is tested with test data (25% data) and finally the percentage of correct outputs is noted.

IV. ANALYSISOF RESULTS

Gap Analysis

The survey questionnaires are administered to the patients as well as hospital staffs of Pradyumna Bal Memorial Hospital (KIMS), Bhubaneswar. For patient survey five department such as medicine, casualty, ENT, surgery and orthopedics were considered. The perceptions and expectations of patient are averaged out and normalized. Normalization is done in order to get the values between 0 and 1. Further, normalization is needed during the modeling by ANN. Then, for each department, P-E gaps are found out.Finally, the gaps emerging from

the survey in all departments for 17 questions are summarized in Table I. In order to get a better understanding of the gaps present between the perception of the patient and their expectations histograms are plotted as shown in figure 1.Similarly, the response of hospital staff including doctors are averaged out and normalized to get the gaps (TableII& Figure 2).

Table I: Gaps Emerged in Different Departments

Question No.	*Gap(P-E)*					*Average Gap*
	Medicine	*Casualty*	*ENT*	*Surgery*	*Orthopaedics*	
1	0.002045	-0.03551	0.007296	0.002507	0.010899	-0.00255
2	0.002602	-0.01453	0.005833	-0.00113	0.009899	0.000535
3	-0.00435	0.01578	-0.00209	-0.00013	0.011899	0.004222
4	0.001212	-0.0122	0.003711	0.006493	-0.0043	-0.00102
5	0.002602	-0.00054	0.002248	0.000524	-0.0053	-0.000092
6	-0.00018	0.006455	-0.01148	-0.00211	0.00785	0.000107
7	0.003826	0.011117	0.000785	0.004162	0.003802	0.004739
8	-0.00068	0.004123	0.010222	0.006493	0.002802	0.004593
9	-0.00296	-0.01919	0.004419	-0.00608	-0.02454	-0.00967
10	0.013225	0.001792	-0.00573	0.000524	-0.00834	0.000294
11	0.000712	-0.00054	-0.01077	0.000524	-0.00834	-0.00368
12	-0.00459	-0.00986	-0.00554	-0.00309	-0.01239	-0.0071
13	-0.00414	0.011351	-0.00573	-0.0064	-0.0063	-0.00224
14	-0.00379	-0.00171	0.004419	0.001395	0.001802	0.000424
15	-0.00279	0.020443	0.003663	-0.0064	0.013948	0.005772
16	-0.00051	0.011117	0.000834	-0.00078	0.002802	0.002692
17	-0.00223	0.011895	-0.00209	0.003509	0.003802	0.002975

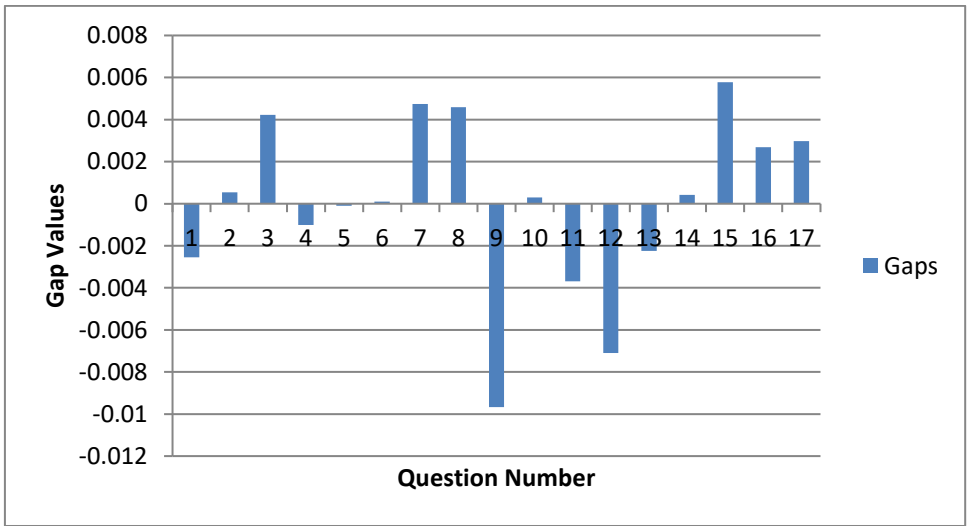

Figure 1: Average Gaps (All Departments)

Table II: Average Gaps for Departmental Staff & Management

Question No.	*Expectation*	*Average Perception*	*Normalized Expectation*	*Normalized Perception*	*Gap(P-E)*
1	5	4.413793	0.1	0.112282	0.012282
2	5	4.275862	0.1	0.108773	0.008773
3	5	4.034483	0.1	0.102632	0.002632
4	5	3.931034	0.1	0.100001	0.000000877
5	5	4.206897	0.1	0.107018	0.007018
6	5	3.931034	0.1	0.100001	0.000000877
7	5	3.689655	0.1	0.09386	-0.00614
8	5	3.827586	0.1	0.097369	-0.00263
9	5	4.068966	0.1	0.10351	0.00351
10	5	2.931034	0.1	0.074562	-0.02544

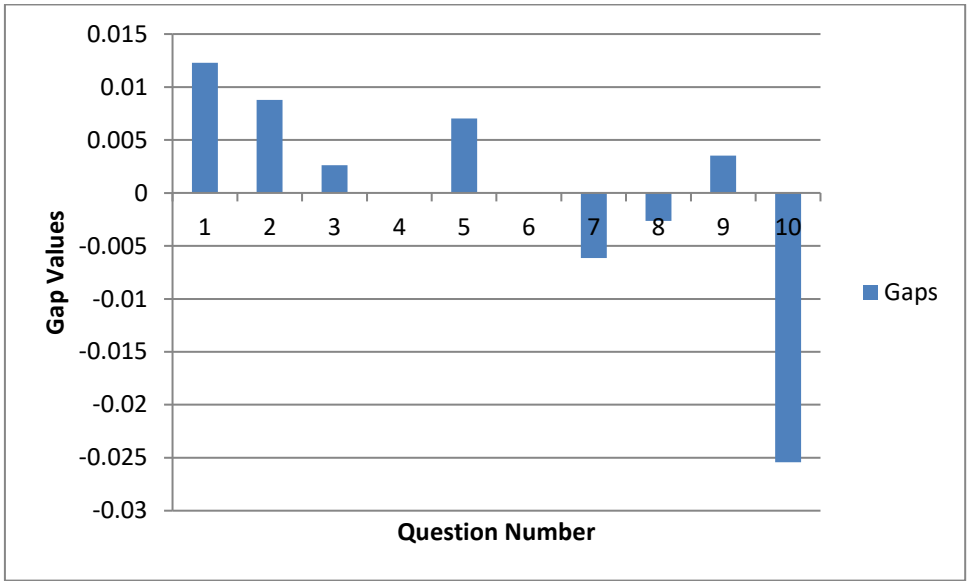

Figure 2: Gap Analysis for Staff and management

In the department of medicine shows maximum negative gap for question number 3 (Availability of the doctor on time), 12 (Understanding the specific needs of the patient & 13 (Discharge process of the hospital) (See appendix 1) which has to be considered for better satisfaction of the customers. Question number 10 (Rate the behavior of the hospital staff) shows the highest positive gap which indicates a very cooperative hospital staffs. Similarly, in casualty department, question number 1,2 4, 9 & 12 shows negative gaps and question number 15 gives the highest positive gap. In ENT department, question numbers 6, 10, 11, 12 & 13 shows negative gaps whereas question number 8 gives the maximum positive gap. In surgery department, question numbers 9,12,13 & 15 shows the maximum negative gaps and question number 4 & 8 both show the highest positive gaps. Lastly, orthopedic department gives negative gaps in question numbers 9,10,11 &12 and maximum positive gaps in question number 15.

In order to have a broad idea about the overall quality of hospital in terms of patient expectations and perceptions, the gaps in each five departments are averaged out for 17 questions (Table I). In figure 1, it is clearly seen that six questions need to be improved for continuous quality improvement of hospital. They are question numbers 9, 12, 11, 1, 13 & 4 (negative gap highest to lowest) (Table III). Some of the questions that are satisfactorily maintained are 3, 7, 8, 15.

Table III: Factors to be Improved

Question No	*Descriptions*	*Decreasing Order*
9	Expenses of the hospital during treatment	↓
12	Understanding the specific needs of the patient	
11	Rate the professionalism of the hospital staff	
1	Rate the concerned doctor	
13	Discharge process of the hospital	
4	Doctor's visit during the patient's stay	

For management and staff the scenario is something different. Question number 10, 7 and 8 shows the negative gaps in decreasing order that need to be focused in order to satisfy the employees of the hospital which has direct relation to the quality of hospital. These items are Staffs are afraid to ask questions when something doesn't feel right (10), The pay scale is satisfactory (7) and The management considers staff suggestion in matters regarding the betterment of hospital (8).Finally, considering both patient and employees' satisfaction the following table (Table IV) gives the appropriate explanation.

Table IV: Suggestions to the Management

Sl. No	*Descriptions*	*Explanations*
Highest Priority for quality improvement	Expenses of the hospital during treatment (9)	The treatment is very expensive
Patient Satisfaction	Understanding the specific needs of the patient (12)	Patient are not properly counseled
	Rate the professionalism of the hospital staff (11)	The expertise of the staff are not satisfactory
	Rate the concerned doctor (1)	Doctors need to be more cooperative with the patient
	Discharge process of the hospital (13)	Require easy and less time consuming discharge process
Lowest Priority for quality improvement	Doctor's visit during the patient's stay (4)	At least three times a doctor should visit the patient instead of two
Highest Priority for quality improvement	Staffs are afraid to ask questions when something doesn't feel right (10)	Management are less friendly with their Employees
Employees Satisfaction	The pay scale is satisfactory (7)	Pay scale should be standardized
Lowest Priority for quality improvement	The management considers staff suggestion in matters regarding the betterment of hospital (8)	Some good staff suggestions can be implemented in hospital

Performance of the Models

From the customer's survey data, the average normalized values are calculated for all the four models discussed earlier. Each of the above models for a particular department is run varying learning parameter, momentum parameter and number of cycles till root mean square error (RMSE) is minimised. A model is said to perform best when percentage of correct outputs is higher for the same RMS value. The learning parameters lie between 0.07 and 0.1 whereas momentum parameter approaches to zero (0.01 to 0.03). The number of cycles varies from model to model for different models. The freely available neural networks software NeuNet 2.1 has been used in this study. The results are shown in Table V.

Table V: Results of Neural Network Models

Departments	*Neural Network models*	*Learning parameter*	*Momentum parameter*	*Number of cycles*	*RMS Error*	*Percentage of correct output*
Medicine	P-E Gap	0.10	0.02	293380	0.21	**77***
	P-only	0.09	0.03	18680	0.22	62
	E-P Gap	0.08	0.01	461380	0.25	69
	E & P	0.09	0.02	379195	0.21	69
Casualty	P-E Gap	0.07	0.01	21775	0.15	90*
	P-only	0.09	0.03	30855	0.15	60
	E-P Gap	0.08	0.01	17725	0.17	70
	E & P	0.10	0.03	3730	0.19	60
ENT	P-E Gap	0.08	0.02	4150	0.15	**70***
	P-only	0.08	0.01	7975	0.17	70
	E-P Gap	0.09	0.03	6500	0.18	70
	E & P	0.10	0.02	3980	0.19	69
Surgery	P-E Gap	0.09	0.03	7095	0.07	**70***
	P-only	0.09	0.01	3350	0.08	70
	E-P Gap	0.09	0.03	7320	0.07	50
	E & P	0.09	0.03	2760	0.07	50
Orthopedics	P-E Gap	0.08	0.03	4150	0.16	**72***
	P-only	0.09	0.03	10320	0.07	50
	E-P Gap	0.09	0.02	379195	0.21	70
	E & P	0.10	0.03	5930	0.19	60

Note: * indicate the highest percentage of correct output

From the above table it may be concluded that P-E gap model performs best for predicting quality in an education set up considering the needs of most important stakeholders. This is exactly same as the result obtained by Parasuraman et al.,1988, 1991 using SERVQUAL applied to a wide range of service industries such as, retail banking, credit card, securities brokerage and product repair and the maintenance [13,14].

V. CONCLUSIONS

The hospital service quality mainly depends upon the expectations and perceptions of the patients. The following conclusions are drawn from the above study and suggestion provided to the management in order to improve quality of this hospital continuously. Firstly, this study reveals that the treatment in KIMS hospital is expensive. Therefore, some mechanism must be implemented by the management to reduce the treatment cost. Secondly, the patient and their relatives should be informed everything and properly counseled regarding everything about disease, expenditure, duration of stay, etc. Doctors and staffs should be more and more cooperative towards to patients and their attendants. The documental process of discharge should be reduced as far as possible. Management should be very cooperative and should be ready to accept suggestions from the patients, their attendants and employees. Finally, the pay scale and rewards should be standardized for the employees for their engorgement towards the goal of continuous quality improvement. The future direction in this study may be more rigorous survey of each and every department in order to get a deep insight to the quality of hospital considering both patient and employees.

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APPENDIX- 1

FEEDBACK FORM FOR PATIENT/CUSTOMERS

NAME:

AGE: **GENDER:**

A. Filling the form for yourself or for others? If others, relation with the patient.

B. Which department of the hospital are you visiting?

QUESTIONNAIRE

Please contribute your valuable opinion on a scale from 1 to 5 as per the following table;

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

Serial No.	Questions	Expectation	Perception

1	Rate the concerned doctor			
2	Rate your appointment scheduling with the doctor			
3	Availability of the doctor on time			
4	Doctor's visit during the patient's stay			
5	Condition of the equipment in the hospital			
6	Modernity of the equipment			
7	Availability of medicines in the emergency department			
8	Availability of state-of-the art testing facilities			
9	Expenses of the hospital during treatment			
10	Rate the behavior of the hospital staff			
11	Rate the professionalism of the hospital staff			
12	Understanding the specific needs of the patient			
13	Discharge process of the hospital			
14	Quality and variety of the food for patients			
15	Quality of food in the cafeteria (quality of food for visitors)			
16	Appropriate location of the hospital			
17	Condition of the washrooms and restrooms in the hospital			

Any special comments: **FEEDBACK FORM FOR HOSPITAL**

MANAGEMENT/STAFF

NAME:

AGE: **GENDER:**

A. Which department of the hospital are you working for?
B. What is your post/designation?

QUESTIONNAIRE

Please contribute your valuable opinion on a scale from 1 to 5 as per the following table;

1	**2**	**3**	**4**	**5**
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

Serial No.	Questions	Rating (from 1 to 5)
1	There is enough staff to handle the workload.	
2	The people in the staff and the management treat each other with respect	
3	When one area in the department gets busy others help out	
4	The hospital units works together as a team to provide best service for patients	
5	Patient safety is never sacrificed to get more work done	
5	Our procedures and systems are good at preventing errors	
7	The pay scale is satisfactory	
8	The management considers staff suggestion in matters regarding the betterment of hospital	
9	Mistakes made by staff in matters of patient safety are reported to the management	
10	Staffs are afraid to ask questions when something doesn't feel right	

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