PEAT

Elevator Maintenance Management in Healthcare Facilities in Johor Bahru

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Abstract: Healthcare facilities need comprehensive elevator maintenance management in order to provide patients, visitors, and other hospital building users, such as healthcare workers, with a safe, quiet elevator that provides the highest level of comfort. Hospitals must have effective elevator maintenance management systems and services to achieve this objective. In addition to elevator safety, building users must be satisfied with the quality of management services, particularly those offered to renters. This research aims to establish the perceived level of satisfaction and occupant expectations about the quality of elevator maintenance services given in healthcare facilities, as well as to identify the fundamental issues encountered by elevator maintenance management and potential solutions. To achieve the main objective, a questionnaire was designed, sent to a representative sample of respondents, and analysed using the Service Quality model. In terms of reliability (0.3), responsiveness (0.07), tangibles (0.03), and empathy (0.04), the findings indicate that tenant expectations and levels of satisfaction are rather high. In contrast, the assurance element received the lowest scores (-0.01). The analytical mean score was developed to show the principal difficulties and possible suggestions for elevator maintenance management in order to maintain the elevator system according to the set priorities, and the findings demonstrate that all techniques are essential. Consequently, it is possible that each of the identified approaches has its own set of goals that must be taken into account and all objectives for this research were achieved.

Keywords: Healthcare Facilities, Service Quality model, Occupant satisfaction, Maintenance management

1. Introduction

Maintenance services quality may be defined as a complete customer assessment of specific services and the amount to which they satisfy user expectations and deliver satisfaction [1]. Buildings

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must be properly maintained in an efficient and effective manner. Initially, goals, plans, and maintenance policies will be attained if appropriate maintenance is performed efficiently [2].

[3] further states that in most developing countries, most elevator users as consumers have safety assurance difficulties since they do not trust the facilities to the point that some have opted not to utilise vertical transportation in particular buildings because they are risky. In healthcare facilities, this situation has a major influence on user satisfaction. The SERVQUAL model is primarily used as a multidimensional research instrument for customer satisfaction and is comprised of the following components: tangible, dependability, responsiveness, assurance, and empathy. User satisfaction and expectations are related to service quality, according to [4].

This study aims to identify and analyse the perceived level of satisfaction and occupant expectation towards the quality of maintenance services implemented in healthcare facilities in Johor Bahru, Malaysia, using the SERVQUAL model, in order to identify the primary challenges associated with elevator system maintenance and its potential recommendations.

By addressing elevator maintenance issues within Johor Bahru's healthcare facilities, it is anticipated that the outcomes of this research would enhance the quality of elevator maintenance services.

2. Literature Review

Literature review can be divided into expectation and satisfaction user on the quality of maintenance services, prime challenges and its possible recommendation and lastly service quality element.

2.1 Expectation and occupant satisfaction towards the quality of elevator maintenance services

Occupant expectation and satisfaction is also evidence of the measurement of the effectiveness and satisfaction of building in managing its operation system. Customer satisfaction is a measurement and factor of how well a product or service meets a customer's expectations, whether those expectations be favourable or negative [5]. Through several metrics, including responses, customer feedback, degree of loyalty, views and opinions, among others, this measurement aims to ascertain the level of acceptability and perception of the product and/or service by consumers and whether it has been accepted or rejected [6]. [7] found that supporting patients, reducing wait times, and making the health facility's environment better are all important for patient satisfaction. Employees satisfaction towards the quality of maintenance service effect the working procedure that also led to customer satisfaction. [8] found that customer satisfaction had a significant moderating effect on service quality and purchase intentions for services like communication, travel, and recreation, but not for healthcare.

2.2 Prime challenges maintaining elevator system

According to [9], the knowledge gap among the personnel deployed to do service work limits their ability to identify early wear indicators of elevator components. This is the major difficulty encountered by elevator maintenance management. Additionally, there is a shortage of qualified engineers and technicians due to the lack of interest in careers in the elevator industry, and finally, the maintenance records of faults and defects of elevator systems provided by elevator contractors are insufficient and unreliable to be used as references [10].

2.3 Possible recommendations to address the challenges

Offering a maintainability grading system, educating the public about proper elevator use, and providing a library of elevator system defects are the three solutions that [9] believe are most helpful in addressing the challenges. A framework consisting of diagnostic and testing methods, best practises, and methods for corrections is provided with the aim of improving the knowledge base of industry players, especially among Facility Managers, in order to address the challenges mentioned above, which include a deficiency on the records of operational defects of elevator system.

2.4 Service quality element

The Service Quality model is abbreviated as SERVQUAL. It was created and executed to measure customer satisfaction and expectations for a variety of services based on five components. According to [11], a list of five experimentally developed service elements, known as SERVQUAL elements, is comprised of the following:
   a. Tangibles: refers to physical facilities, equipment, and material
   b. Reliability: refers to the ability of the firm to perform the service effectively and accurately
   c. Responsiveness: refers to the firm and its ability and willingness to aid customers and provide service as promised
   d. Assurance: refers to the employees of the firm. It is their skill to produce trust and credibility
   e. Empathy: refers to the attention and priority the organization gives to the needs and requests of the customers.

The SERVQUAL model is a great scale to utilise for assessing service quality in different particular industries, according to research that was done by [10].

3. Methodology

The methodology developed in this study is largely driven by the research objectives.

3.1 Data collection

Journals, books, articles, thesis, and the internet were utilised as secondary data sources in the research to gather the data required to develop the model and analysis. The survey was utilised as the primary data source to gather pertinent information. A questionnaire and an online Google form survey were used to gather data in a way that was convenient for the respondents.

In this research, the questionnaire was developed according to the SERVQUAL paradigm, which consists of five elements: tangibles, reliability, assurance, empathy, and responsiveness [10]. Table 1 illustrates that each questionnaire item has a 22-item limit and has been converted to the SERVQUAL model, as specified by [10]. Table 1 below shown the service quality model items.

Table 1: SERVQUAL model items [10]

Element	No. of Item
Tangibles	4
Reliabilities	5
Responsiveness	4
Assurance	4
Empathy	5

In this research, two questionnaires were used which are questionnaires one and two. Questionnaire one was completed by gathering information from occupants at Hospital Sultanah Aminah, Hospital Sultan Ismail, and KPJ Puteri Specialist Hospital, while Questionnaire two was completed by gathering information from elevator maintenance management. The survey sample data was completed and collected. Furthermore, the questions are Likert-style, requiring responders to provide feedback for each item.

3.2 Methodology of statistical analysis

The SERVQUAL score analysis was used. The formulation of calculating the analysis score was done as stated in Table 2 below:

$$SERVQUAL\ score= (Expectation\ score–Satisfaction\ score) \qquad Eq.1$$

Table 2: SERVQUAL score interpretation

SERVQUAL score = (Expectation score – Satisfaction score)	
Expectation = Satisfaction	Quality services
Expectation < Satisfaction	Excellent or extraordinary level of quality
Expectation > Satisfaction	Shortfall or lack of quality (deficient quality)

Furthermore, mean score was calculated in this research to identify the prime challenges and its possible recommendation for maintaining elevator system. As shown in Table 3 below, the mean score standards for the variables this research looked at have been set.

Table 3: Mean score and their description

Mean score	Description
1.00-2.00	Strongly disagree
2.00-3.00	Disagree
3.00-4.00	Neutral
4.00-5.00	Agree
5.00	Strongly agree

3.3 Validity and reliability

Validity and reliability are among the most crucial factors for evaluating the credibility of research findings and outcomes. The questionnaire was analysed by thirty (30) samples (N) of elevator industry experts and experienced professionals. Respondents employed with Medivest Sdn Bhd, the elevator maintenance business for Hospital Sultanah Aminah and Hospital Sultan Ismail. Between 10 December 2022 and 20 December 2022, the questionnaire was given to them for analysis and assessment of the question posed.

4. Results and Discussion

The findings and analysis of the collected data are shown in Table 4 in terms of gender, age, occupation, and working year length. A sample of the questionnaire was provided to occupants of Hospital Sultanah Aminah, Hospital Sultan Ismail, and KPJ Puteri Specialist Hospital to reflect the main objective.

Table 4: Demographic respondent

Characteristic		Frequency (n)	Percent
Questionnaire One			
Gender	Male	156	55.4
	Female	127	44.9
Age	20-29	99	35.0
	30-39	54	20.5
	40-49	66	23.3
	50-59	41	14.5
	Above 60	19	6.7
Job	Doctor	54	19.1
	Nurse	59	24.4
	Technician	58	20.5
	Administrator	75	26.5
	Others	27	9.5
Working years	Less than 1 year	61	21.6

1-2 years	58	20.5	
3-5 years	55	19.4	
5-10 years	47	16.6	
Over 10 years	62	21.9	
Questionnaire Two			
Gender	Male	6	100.0
	Female	0	0
Age	20-29	3	50
	30-39	2	33
	40-49	1	17
	50-59	0	0
	Above 60	0	0

The distribution shows that men represent 55.4% of the 156 respondents, while the ratio of females is 44.9%. The result indicates that most of the respondents (35.0%) are from the age range of 20 to 29 years old. Distribution by job shows that most respondents are working as administrator (26.5%). Furthermore, the distribution by working years shows that 62 respondents (21.9%) working over 10 years in their hospital. A sample from questionnaire two represented the second objective and third objective and was distributed to the elevator maintenance management. The distribution shows that all 6 respondents are male (100.0%). The result indicates that half of the respondents (50%), from age 20–29 years old.

4.1 Level of occupant expectation and satisfaction towards the quality of elevator maintenance service

To evaluate the quality of elevator maintenance service, the SERVQUAL questionnaire was used. The averaged findings are shown in Table 5 after the results. For each SERVQUAL component, the mean of occupant expectations is also determined. The outcome displays the mean occupant expectation scores, which range from 3.87 to 3.66 on a five-point scale. The mean scores for occupant satisfaction, however, vary from 3.86 to 3.65.

Table 5: SERVQUAL score all item

Question Number	Item	Expectation Mean	Satisfaction Mean	SERVQUAL Score Mean	Rank
		Tangibles			
S1	Control Panels design	3.66	3.74	-0.08	22
S2	Ceiling lights inside the elevator	3.77	3.80	-0.02	18
S3	Spacious elevator	3.73	3.69	0.04	12
S4	Aesthetic design inside elevator	3.86	3.69	0.17	1
	Overall mean of tangibles variables	3.75	3.73	0.03	■■■■
		Reliability			
S5	The elevator runs smoothly and comfortably with low failure	3.77	3.80	-0.02	17
S6	Good quality elevator accessories	3.74	3.69	0.06	6
S7	Reliable maintenance quality and compliance with acceptance standards	3.78	3.76	0.02	14
S8	Ability to inform customers of the correct process required to complete the service	3.77	3.80	-0.03	19
S9	Information related to maintenance is provided to occupants promptly.	3.87	3.76	0.10	3
	Overall mean of reliabilities variables	3.79	3.76	0.03	■■■■
		Responsiveness			
S10	Respond quickly to faults and troubleshoot problems quickly	3.78	3.71	0.06	7

S11	After receiving the users, fault call, arrive at the scene within 1 hour	3.82	3.65	0.17	2
S12	Respond to occupant's inquiries in a relatively short time	3.77	3.70	0.07	5
S13	The staff working, managing, and serving well	3.79	3.80	-0.01	16
	Overall mean of responsiveness variables	3.79	3.72	0.07	▮▮▮
Assurance					
S14	Maintenance personnel are well-groomed and neatly dressed	3.79	3.76	0.04	9
S15	Maintenance personnel have sufficient professional knowledge and skills	3.79	3.85	-0.06	20
S16	Detailed and comprehensive answers to customer consultations by service person	3.85	3.81	0.05	8
S17	After the maintenance is completed, the site environment is clean and tidy	3.79	3.86	-0.07	21
	Overall mean of assurance variables	3.81	3.82	-0.01	▮▮▮
Empathy					
S18	Quality of maintenance services provided	3.80	3.77	0.04	10
S19	Collection of occupant opinions on the evaluation of the quality of maintenance services	3.80	3.72	0.08	4
S20	Users' questions and feedback listened to, responded to, and handled quickly and adequately by the management	3.79	3.75	0.04	11
S21	Renovation of maintenance services performed for the users	3.82	3.80	0.03	13
S22	Reducing the amount of downtime for elevator's user	3.77	3.77	0.00	15
	Overall mean of empathy variables	3.80	3.76	0.04	▮▮▮

According to [12], quality is a comparison between expectation and satisfaction. Each SERVQUAL score is calculated and viewed based on the interpretation of the SERVQUAL score. Table 6 shows the overall SERVQUAL score on each element. Responsiveness rank first for the highest priority of SERVQUAL score. The variables of this element are related to and reflect the ability to perform the promised services reliably and accurately by maintenance management in terms of time, cost, and quality, which are directly influenced by the resource base of the organisation in terms of budget and system. In addition, the empathy element indicates the second position of the highest priority SERVQUAL score and tangible element indicate the third position of the highest priority SERVQUAL score. The variables of this element relate to physical convenience and the equipment provided to the user. The variables of this element are related to and reflect those of human factors.

Table 6: SERVQUAL score for 5 elements

Elements	Expectation mean (S)	Satisfaction mean (E)	Service quality score (G) G = E - S	Classification	Priority
Tangible	3.75	3.73	0.03	Deficient quality	3
Reliability	3.79	3.76	0.03	Deficient quality	4
Responsiveness	3.79	3.72	0.07	Deficient quality	1
Assurance	3.81	3.82	-0.01	Excellent level of quality	5
Empathy	3.80	3.76	0.04	Deficient quality	2

The results of this study show that the satisfaction level is lower than expected the higher the SERVQUAL score. The above four elements with the highest SERVQUAL score show that occupants are unhappiest with these four elements. The results indicate that the elements of tangibles (0.03), reliability (0.3), responsiveness (0.07), and empathy (0.04) have a classification deficient quality. On the other hand, the element of assurance (-0.01) was rated as having excellent quality levels.

The SERVQUAL model's aspects assurance, which has a positive and substantial influence on customer satisfaction. Customers were satisfied with the response of the personnel. The variables of this element are related to and reflect those of human factors.

4.2 The prime challenges maintaining elevator system

To evaluate the maintenance challenges maintaining elevator system, the questionnaire was analysed by calculating mean score. Table 7 below show the detail mean score value for each question.

Table 7: Mean score against aspects of prime challenges

Maintenance Challenges		Service Quality					Mean Score
		1	2	3	4	5	
		Strongly Agree	Agree	Intermediate	Disagree	Strongly Disagree	
Insufficient maintenance record	Detail description of system's fault will not be recorded	1	3	0	2	0	3.50
	No photos will be attached to the record	1	4	1	0	0	4.00
	The maintenance kept and but not available when requested	1	2	1	2	0	3.33
Limited skilled manpower	Older generations are leaving the workforce	1	4	1	0	0	4.00
	Younger generations are gravitating away from Industrial Maintenance	0	4	2	0	0	3.67
	Emerging technologies that require more diversified skill sets	0	4	1	1	0	3.50
Lack knowledge	Does not know the correct way to handle one maintenance task without having all of the required information	1	4	1	0	0	4.00
	No changes to the knowledge-based framework	0	5	0	1	0	3.67
	Experienced staff does not share their experience and knowledge to new employees	0	2	2	2	0	3.00

The result for prime challenges faced by elevator maintenance management was analysed by calculating the mean score and the result show that all respondents' description towards the challenges are natural, agree and strongly agree with range of mean score 3.00 to 4.00. This shows that all prime challenges that stated in the questionnaires mainly faced by them when they maintained the elevator system.

4.3 Possible recommendations to address the challenges

The surveys were analysed by computing the mean score value in order to assess potential recommendations to overcome the challenges. The mean score results are shown in Table 8 below after the results.

Table 8: Mean score against aspects of possible recommendations

Possible Recommendations		Service Quality					Mean Score
		1	2	3	4	5	
		Strongly Agree	Agree	Intermediate	Disagree	Strongly Disagree	
Insufficient maintenance record	Name of person or organisation providing maintenance, repair or replacement and etc. must be recorded in detail	4	2	0	0	0	4.67
	Photos must be attached to the record for the future references	4	2	0	0	0	4.67
	The record must be available to elevator personnel including mechanics and inspectors	4	2	0	0	0	4.67
Limited skilled manpower	Train existing employees	4	2	0	0	0	4.67
	Re-evaluate the management's practices to hiring new staff.	1	4	1	0	0	4.00
	Apply workforce skills in a different way	1	5	0	0	0	4.17
Lack knowledge	Having learning session with experience staff if need to maintain new component	2	4	0	0	0	4.33
	Changes to the knowledge-based model and learning are necessary to increase the organization's efficiency	4	2	0	0	0	4.67
	Experienced staff impact system reliability and may improve knowledge organisation	2	4	0	0	0	4.33

The result for possible recommendation to address the challenges faced by elevator maintenance management was analysed by calculating the mean score and the result show that all respondent's description towards the challenges are agree and strongly agree with range of mean score 4.00 to 4.67. This shows that the respondents acknowledge all 9 items possible recommendation to address the prime challenges that stated in the questionnaires.

5. Conclusion and Recommendations

This study has identified and analysed the perceived level of satisfaction and occupant expectation towards the quality of elevator maintenance services implemented in the healthcare facilities and identified the prime challenges also its possible recommendation. Several factors that affect the quality of maintenance services, namely the elements present in the SERVQUAL model. These are the elements: tangibles. reliability. responsiveness, assurance, and empathy. The analysis shows that the three elements of the SERVQUAL model involved have a high priority score, which are responsiveness, empathy, and tangible. However, the other two elements that have a lowest priority score are reliabilities and assurance.

Based on the questionnaire two, a total of 3 items of prime challenges and possible recommendation with 3 detail examples for each item have been identified for maintaining elevator system. In total, all 3 prime challenges that identified using mean score with description from neutral to strongly agree meanwhile for the possible recommendation to address the challenges result from the research have description as agree and strongly agree. All item of the prime challenges and its possible recommendation identified are indispensable and very important. The value of the mean score that has been obtained is used to judge these results.

The researcher suggests that future researchers perform a more detailed study on the efficacy of elevator maintenance services in healthcare facilities, focusing on hospital maintenance practises and processes. Problems with the maintenance work, inspections, duration of maintenance, and the hard-to-achieve quality of maintenance services are some of them. Thus, the poor quality of maintenance services may be investigated, such as whether a low-grade product brand is used or if maintenance is conducted improperly.

Acknowledgement

References

[1]   Al-Jazzazi, A.; Sultan, P. Demographic. (2017) differences in Jordanian bank service quality perceptions. Int. J. Bank Mark, 35, 275-297.

[2]   Khalid, E. I., Abdullah, S., Hanafi, M. H., Said, S. Y., & Hasim, M. S. (2019). The consideration of building maintenance at design stage in public buildings: The current scenario in Malaysia. Facilities, 37(13–14), 942–960.

[3]   Bernard, A. (2014). Lifted: A Cultural History of the Elevator. New York University Press.

[4]   Agbor, J.M. (2011). The Relationship between Customer Satisfaction and Service Quality. A Study of Three Service Sectors in Umea; Umea University, Faculty of Social Sciences: Umea, Sweden.

[5]   Gitman Lawrence, J., & McDaniel, C. D. (2005). The Future of Business: The Essentials. Mason, Ohio: South-Western.

[6]   John, J. (2003). Fundamentals of Customer-Focused Management: Competing Through Service. Westport, Conn.: Praeger.

[7]   Petruzzellis, L., D'Uggento, A. M., & Romanazzi, S. (2006). Student satisfaction and quality of service in Italian universities. Managing Service Quality, 16(4), 349–364.

[8]   Shah Kamal Ideris, M., Ting Yi, L., Mohd Rodzi, S., Rahim Romle, A., Akmal Hakim Mohamad Zabri, M., & Azlindamazlini Mahamad, N. (2016). Students' Satisfaction on Facilities in Universiti Utara Malaysia. World Applied Sciences Journal, 34(6), 795–800.

[9]   Siti, N. A., Asmone, A. S., & Chew, M. Y. L. (2018). An assessment of maintainability of elevator system to improve facilities management knowledge-base. In IOP Conference Series: Earth and Environmental Science (Vol. 117, No. 1, p. 012025). IOP Publishing.

[10]   Ladhari, R. (2009). A review of twenty years of SERVQUAL research, International Journal of Quality and Service Sciences, Vol. 1, Number 2. P.172-198.

[11]   Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1988), "SERVQUAL: a multiple-item scale for measuring consumer perceptions of service quality", Journal of Retailing, Spring, Pp. 12-40.

[12]   Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1985), "A conceptual model of service quality and its implications for future research", J. Marketing, Vol. 49 No. 4, pp. 41-50.