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Evaluation of the Quality of Railways Performance in Iraq (Baghdad -Basra Line as a Case Study)

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Keywords:
Projects management; Quality performance; Railway management; Service quality; Railway quality service.

Highlights:

- Quality of the railways performance.
- Evaluating railway quality performance by using the SERVQUAL model.
- Baghdad- Basra railway line was taken as a case study.

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Abstract: The Iraqi railways are considered one of the first railways established in the Middle East. Iraq's geographical location made it a connecting point between the region countries, Asia, and Europe, as the Iraqi railway network extended to Iran, Kuwait, the Arabian Gulf, and Saudi Arabia. The war conditions that the country went through affected the services provided by the railways. The research aims to assess the performance of the Baghdad-Basra railway by measuring the level of service for this line as a model for evaluating the quality of the railways' performance in Iraq. The research goal was achieved in two stages. In the first stage, theoretical information about the research subject was collected. In the second stage, 32 samples were collected from train trips for the Baghdad-Basra railway. Each sample included details of train trips on different dates (2009-2012). The reasons for the deviations at the time of the train arrival were determined by analyzing the samples, calculating the actual time and the planned time for the train trip, and proposing appropriate solutions to solve the problem of deviations and improve the quality of the performance of the railway line.

تقييم جودة أداء سكك الحديد في العراق (خط بغداد - البصرة كحالة دراسية)

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الخلاصة

تعتبر سكك حديد العراق من اوائل خطوط السكك الحديدية التي انشأت في الشرق الاوسط موقع العراق الجغرافي جعله نقطة ربط بين دول المنطقة واسيا واوربا حيث امتدت شبكة السكك الحديدية العراقية لتصل إيران والكويت والخليج العربي والمملكة العربية السعودية. أثرت ظروف الحرب التي مرت بها البلاد على الخدمات التي تقدمها السكك الحديدية. يهدف البحث إلى تقييم جودة أداء خط سكة الحديد بغداد – البصرة من خلال قياس مستوى الخدمة لهذا الخط انموذجا لتقييم جودة اداء سكك الحديد في العراق تم تحقيق هدف البحث على مرحلتين، اذ تم في المرحلة الاولى جمع المعلومات النظرية المتعلقة بموضوع البحث وفي المرحلة الثانية تم جمع ٣٢ عينة من رحلات القطارات لخط سكة الحديد بغداد -البصرة وتتضمن كل عينة تفاصيل رحلات القطارات بتواريخ مختلفة خلال الاعوام (٢٠٠٩- ٢٠١٢). تم تحديد أسباب الانحرافات في وقت وصول القطار من خلال تحليل العينات وحساب الوقت الفعلي والوقت المخطط لرحلة القطار واقتراح الحلول المناسبة لحل مشكلة الانحرافات وتحسين جودة اداء خط السكة الحديد.

الكلمات الدالة: ادارة المشاريع، جودة الاداء، ادارة سكك الحديد، جودة الخدمة، جودة الخدمة في سكك الحديد.

1.INTRODUCTION

International experiences confirm the importance of developing and regulating the transport sectors, as they are linked to countries' civilizational development and urbanization. The transport sector plays a vital role in various aspects of modern life because of the population's dependence and economic activities increasingly on developing transport services to achieve the transport and mobility requirements for individuals and goods [1]. There are three transport styles: shipping, road, and railway [2]. Railway transport means carrying products and passengers from one place to another using trains. Railways transport is cheaper as compared to transport. Goods will be carried in bulk quantities, which saves lots of time, and several individuals get employment directly and indirectly through the Railway [3]. The quality of public transit service, directly associated with user experience, has been identified as a major concern for the public in selecting travel modes [4]. Recently, assessing the service quality of public transportation has become a very popular topic among researchers [5]. Alçura et al. [6] used two well-known methods, Servqual and Impact Score Technique (IST), to determine the service quality of the High-Speed Rail System of Turkey operated between Eskisehir and Ankara. Bakti et al. [7] developed a perceived service quality model that can be implemented in Jabodetabek railway commuter line service. The developed model integrated the utilitarian dimension, hedonic dimension, and "filter" variables that can influence perceived service quality. Alam and Mondal [8] applied a hybrid approach integrating SERVQUAL and the Analytical Hierarchy Process to evaluate the service quality of urban sanitation in the railway slum of Khulna City. Bhatnagar and Ram [9] identified Equivalent Passenger Units from passenger behavior and anthropometric studies. Equivalent Passenger Units were employed to gauge the extent of services for the passenger's mobility within the terminal building. The railway transport sector in Iraq suffers from a noticeable deterioration in the level of services provided to travelers and owners of goods, which has led to the reluctance of most individuals to acquire this mode of transportation despite it being one of the cheapest means of transportation [10]. Thus, this research aims to assess the level of service of the Iraqi railways and the ways to ensure the improvement of its services.

2.IRAQI RAILWAYS

Development plans of Iraq during the sixties, seventies, and the beginning of the eighties of the last century gave great attention to the transport and communications sector. These plans included implementing many infrastructure projects for this vital sector; most were strategic. In the field of railways, the goal of the strategy during the sixties was to convert railways from the metric system to the standard system, while the seventies and eighties of the last century were aimed at linking the centers of industrial production with the centers of consumption and export, the transverse link between cities introducing the latest developments and developments on the quality and specifications of railways and directing the preparation of designs for new axes with modern and advanced specifications [1]. Iraq Republic Railways Company (IRR) is a government company affiliated with the Iraqi Ministry of Transport, a network of Railways consisting of 2000 km and 115 stations. It is in Baghdad and nine governorates, connected to the Syrian Railway network and from there to Turkey and Europe [11]. A brief history of Iraq Republic Railways Company can be listed as the following: In 1914, the first train operated between Baghdad –Samra and Al-Digail. In 1920, the first train operated between Baghdad and Basrah. In 1925, the first train was operated between Baghdad and Kirkuk. On July 15, 1940,

the first train operated between Baghdad and HayderBasha (Istanbul). In 1916, the first railway administration was formed in Iraq under British Military control. On April 1, 1920, the administration was transferred from Military to British civil administration. In July 1936, the first Board of Railway was formed and composed of the minister of Economy, chief of army staff, director general of municipal, director of building, navigation, railway and ministry of financial adviser, and director of movements and trade. The foundation stone for the international station was laid in Al-Karkh, Baghdad, in 1948, and the building was completed in 1952. The Railway Establishment Law on. 24 was issued in 1952. The Iraq Republic Railway Establishment no. 33 was formed in 1965. In 1967, the first train was operated between Baghdad and Basra on the standard line. The Iraq Railway institution was formed on May 20, 1987. The network of IRR is composed of 4 main lines, whose locations have been named as follows [12]:

- The north line has a 524 km length: Baghdad- Mosul- Rabia'a.
- The south line has a 609 km length: Baghdad- Basrah.
- The west line has a 520 km length: Baghdad – Qaim- Akashat.
- The transverse line with 252 km length: Haqlaniyah - Baiji - Kirkuk.

3.(BAGHDAD - BASRA) RAILWAY LINE

The railway line between Baghdad and Basra Round-trip is the only locomotive line in Iraq after 2003, consisting of (39) stations. The Quality Control Section at the Central Station in Baghdad monitors the PROGRESS of the trains from Baghdad to Basra and vice versa. The system adopted and the mechanism used to monitor the work of trains today is an old mechanism that relies on manual documentation. It can be summarized as follows:

- Putting a planned schedule (telegram) for the train's arrival and stops at each station on the train track, as shown in Table 1.
- The train departs from the central station in Baghdad toward Basra, according to the time fixed in the (telegram).
- A special sheet is used to explain the train trip through stations in the vertical direction, and the time of its journey during 24 hours in the horizontal direction. The train line from Baghdad toward Basra is called Descended, while the train vector from Basra toward Baghdad is called Rising (as Basra is located south of Baghdad).
- Through the continuous communication between the employees of the Quality Control department at the central station in Baghdad, the locomotive drivers, and administrative staff at stations, times for the train's arrival at each station are recorded in the sheet.

Table 1 Sample of Telegrams.

Technical 8/37 in 2010/7/1 **Attached to a technical Telegraphic 8/36 in 2010/6/24 be train times descended 20 as the following**				
Baghdad (1830)	M.yard (1839)	Mansor (1857)	Dawra (1909)	Al Yusfia (1918)
Al Mahmudi (1926)	Eskandriyah (1952)	Al Musiib (2004)	Almahawil (2014)	Hilaa (2043)
Hadid (2056)	Alhasimia (2106)	Qujan (2117)	Alsharifi (2124)	Alsuniya (2139)
Dywania (2156)	Nubiu Mudyan (2223)	Alhamza (2238)	Abw Tabikh (2257)	Alrumaytha (2314)
Alhijama (2333)	Buhyrat Sawa (2347)	Samawa (2355)	Alkhafura (0019)	Alkhudar (0036)
Aldaraji (0046)	Albatha (0125)	Alfawzia (0149)	Nassrya (0210)	Alkhandaq (0233)
Suq Alshuyukh (0255)	Alkarmasha (0316)	Aalshuwayearia (0333)	Laket (0352)	Alghabishia (0409)
Artawi (0440)	Ramallah (0503)	Altuwba (0526)	Shaubah (0547)	Basra (0548)

4.RESEARCH METHODOLOGY

The study's aim was achieved according to the following methodology:

- **Collecting Data:**
  To assess the level of service given to travelers, data was collected about the railway line between Baghdad and Basra, while other railways were out of work when preparing the research due to the security situation and military operations in Iraq. (32) Random samples of train trips for (2009 – 2012) were taken from the Quality Control department at the central station in Baghdad to determine the arrival train's time at each station. Each sample consists of Baghdad-Dywania, Dywania-Nassrya, and Nassrya–Basra stations. Sometimes, when there are no passengers, the train does not stop at a station, and the arrival time is estimated to avoid the gap in data.
- **Analyzing Data:**
  After collecting data about train trips for 32 samples, the Actual Time for train arrival to a station (ATFRT) and Planned Time For train arrival to a station (PTFRT) were determined. The quality of the services provided by the

Iraqi railways was fined using the SERVQUAL model. The SERVQUAL model is used to measure the service quality = Actual Time for train arrival to a station (ATFRT) - Planned Time For train arrival to a station (PTFRT), in abbreviated Q= ATFRT- PTFRT. The gap in train arrival time between Actual and Planned is considered service quality and is evaluated from Eq. (1). [13].

$$SQ = \frac{\sum_{i=1}^{n}[(ATFRT)_i - (PTFRT)_i]}{n} \quad (1)$$

Where:

SQ = service quality for train arrival

$(ATFRT)_i$ = Actual Time For train arrival to a station Descended or ascending

$(PTFRT)_i$ = planning Time For train arrival to a station Descended or ascending

n = number of stations (=39).

Table 2 tabulates sample that represents the difference between the actual and planned time for a descended train (from Baghdad to Basra) as the negative signal in (difference column) between the planned and actual time indicates the late arrival of the train, while the sum of the total deviations in the planned time of the train journey from the first station in Baghdad to the last station in Basra was (-0.68) and represents the difference between the actual and planned time for ascending train (from Basra to Baghdad). Table 3 shows Eq. (1) results to evaluate the quality of service.

Table 2 Sample for the Level of Service for Train Rising from Baghdad to Basra.

Name of Train	**21 R. * Fast 2823**		
Telegraphic	**Technical 8/8 in 2011/2/22**		
Date	**(1-2)/4/2011**		
Station	**Descended(planning)**	**Actual**	**(Minute %) Difference**
Baghdad	6.05	6.04	0.01
M.yard	5.56	5.58	-0.02
Mansor	5.38	5.37	0.01
Dawra	5.26	5.24	0.02
Al Yusfia	5.17	5.19	-0.02
Al Mahmudi	5.08	5.16	-0.08
Eskandriyah	4.42	4.47	-0.05
Al Musiib	4.3	4.3	0
Almahawil	4.15	4.15	0
Hilaa	4	4.03	-0.03
Hadid	3.47	3.5	-0.03
Alhasimia	3.37	3.41	-0.04
Qujan	3.26	3.27	-0.01
Alsharifi	3.19	3.2	-0.01
Alsuniya	3.04	3.55	-0.51
Dywania	2.47	2.5	-0.03
Nubiu Mudyan	2.2	2.25	-0.05
Alhamza	2.05	2.05	0
Abw Tabikh	1.46	1.05	0.41
Alrumaytha	1.29	1.3	-0.01
Alhijama	1.1	1.1	0
Buhyrat Sawa	0.56	0.5	0.06
Samawa	0.48	0.2	0.28
Alkhafura	0.23	0.1	0.13
Alkhudar	0.06	0.05	0.01
Aldaraji	23.4	23.5	-0.1
Albatha	23.17	23.2	-0.03
Alfawzia	22.53	22.5	0.03
Nassrya	22.31	22.2	0.11
Alkhandaq	22.07	22.1	-0.03
Suq Alshuyukh	21.44	21.55	-0.11
Alkarmasha	21.23	21.35	-0.12
Aalshuwayearia	21.06	21.2	-0.14
Laket	20.47	21	-0.13
Alghabishia	20.3	20.4	-0.1
Artawi	19.59	20	-0.01
Ramallah	19.36	19.35	0.01
Altuwba	19.13	19.1	0.03
Shaubah	18.52	18.55	-0.03
Basra	18.3	18.3	0
∑			-0.68

*R. (Rising train from Basra toward Baghdad)

Table 3 Summation of the Difference time between Planned and Actual.

Name of Train	Telegraphic	Date	Total Deviation of the Track*1	Deviation Rate*2
D.20 F.2715	Technical 8/100 IN 2009/11/3	(12-13)/5/2010	-3.64	-9.33
D.20 F. 2707	Technical 8/100 IN 2009/11/3	(13-14)/5/2010	31.72	81.33
R.21 F.2715	Technical 8/100 IN 2009/11/3	(12-13)/5/2010	4.96	12.72
R.21 F.2733	Technical 8/100 IN 2009/11/3	(12-13)/5/2010	-32.77	-84.03
D.20 F.2703	Technical 8/37 IN 2010/7/1	(3-4)/8/2010	25.09	64.33
D.20 F.2812	Technical 8/37 IN 2010/7/1	(2-3)/8/2010	33.72	86.46
D.20 F.2809	Technical 8/37 IN 2010/7/1	(2-1)/8/2010	11.14	28.56
R.21 F.2812	Technical 8/37 IN 2010/7/1	(3-4)/8/2010	8.41	21.56
R.21F.2815	Technical 8/37 IN 2010/7/1	(3-2)/8/2010	19.21	49.26
R.21 F.2708	Technical 8/37 IN 2010/7/1	(2-1)/8/2010	-3.39	-8.69
D.20 F.2812	Technical 8/37 IN 2010/7/1	(2-3)/9/2010	-3.51	-9.00
D.20 F.2745	Technical 8/37 IN 2010/7/1	(3-4)/9/2010	14.54	37.28
D.20 F.2561	Technical 8/37 IN 2010/7/1	(1-2)/9/2010	-19.16	-49.13
R.21 F.2826	Technical 8/37 IN 2010/7/1	(3-4)/9/2010	-6.34	-16.26
R.21F.2561+2727	Technical 8/37 IN 2010/7/1	(2-3)/9/2010	-3.03	-7.77
R.21F.2809	Technical 8/37 IN 2010/7/1	(3-4)/9/2010	-6.34	-16.26
R.21 F.2733	Technical 8/37 IN 2010/7/1	(1-2)/9/2010	-14.99	-38.44
D .20 F.2559	Technical 8/37 IN 2010/7/1	(3-2)/10/2010	0.15	0.38
D.20F.2729	Technical 8/37 IN 2010/7/1	(1-2)/10/2010	26.80	68.72
R.21 F.2826	Technical 8/37 IN 2010/7/1	(3-2)/10/2010	-2.61	-6.69
D.20 F.2745	Technical 8/8 in 2011/2/22	(1-2)/4/2011	-6.65	-17.05
D.20 F.2733	Technical 8/8 in 2011/2/22	(3-4)/4/2011	-24.27	-62.23
D.20 F. 2704	Technical 8/8 in 2011/2/22	(2-3)/4/2011	-38.66	-99.13
R.21 F.2823	Technical 8/8 in 2011/2/22	(1-2)/4/2011	-0.68	-1.74
R.21 F.2745	Technical 8/8 in 2011/2/22	(2-3)/4/2011	-9.24	-23.69
R.21 F.2704	Technical 8/8 in 2011/2/22	(3-4)/4/2011	-16.59	-42.54
D.20 F.2745	Technical 8/13 IN 2011/4/11	(3)/10/2011	17.00	43.59
D.20 F.2729	Technical 8/13 IN 2011/4/11	(3-4)/10/2011	1.60	4.10
D.20 F.2733	Technical 8/13 IN 2011/4/11	(2-1)/10/2011	27.17	69.67
R.21F.2745	Technical 8/13 IN 2011/4/11	(3)/10/2011	0.87	2.23
R.21 F.2704	Technical 8/13 IN 2011/4/11	(1-2)/10/2011	-14.73	-37.77
R.21 F. 2733	Technical 8/13 IN 2011/4/11	(2-3)/10/2011	-15.18	-38.92

1* the sum of the deviation is the sum of the difference between ATFRT and STFRT
2*deviation rate=sum of deviation/39

5.RESULTS AND DISCUSSION

Correlation between the service levels for each sample and the difference between the planned and actual time (deviation) of the same sample at each station were found to determine which stations have a higher correlation between the deviation percentage and the service level. Table 4 indicates which stations had problems and caused a time deviation between the planned and the actual time of the trains passing through these stations. The negative sign was neglected because, as previously mentioned, the negative sign indicates that the train arrived at the stations late or ahead of the planned time. Seventeen stations from 39 stations indicated as having problems, which means almost 40% of them had problems. The stations correlated to the time deviation from the plan started from the Diwaniyah station and have a series almost, as shown in Fig. 1. Table 5 shows that 82% of the stations located within the region that was identified in Fig. 2 had delays according to their time deviation rate, as can be noticed that 14 stations from 17 stations' average time deviation are negative. When analyzing the data and determining the four regions that include the stations most closely related to the time deviation shown in Fig. 1, it was required to study the reasons for this deviation during the identification of accidents that caused delays in these stations and during the period of the 32 research samples used in the study. The most frequent accidents that caused delays can be summarized in Table 6. Some stations did not get frequent accidents to occur; however, comparing the times between the planned and the actual arrival of the locomotives to these stations, it was found that there was a deviation in time. The reason is the accumulation of deviation from the previous stations reflected on these stations, i.e., when treating the problems that caused the deviation in the previous stations, the deviation in this station will be automatically treated.

Table 4 The Station that had a High Correlation Ratio Deviation (more than 0.5).

Station	Correlation value	High correlation
Baghdad	0.1	no
M.yard	0.1	no
Mansor	0.1	no
Dawra	0.1	no
Al Yusfia	0.1	no
Al Mahmudi	0.1	no
Eskandriyah	0.1	no
Al Musiib	0.0	no
Almahawil	0.0	no
Hilaa	0.0	no
Hadid	-0.1	no
Alhasimia	-0.2	no
Qujan	-0.2	no
Alsharifi	0.2	no
Alsuniya	-0.2	no
Dywania	-0.7	yes
Nubiu Mudyan	-0.6	yes
Alhamza	0.3	no
Abw Tabikh	0.3	no
Alrumaytha	0.6	yes
Alhijama	0.7	yes
Buhyrat Sawa	0.7	yes
Samawa	0.5	yes
Alkhafura	0.5	yes
Alkhudar	0.4	no
Aldaraji	0.3	no
Albatha	0.0	no
Alfawzia	0.1	no
Nassrya	0.1	no
Alkhandaq	-0.7	yes
Suq Alshuyukh	-0.6	yes
Alkarmasha	-0.6	yes
Aalshuwayearia	-0.7	yes
Laket	-0.6	yes
Alghabishia	-0.7	yes
Artawi	-0.6	yes
Ramallah	-0.1	no
Altuwba	-0.6	yes
Shaubah	-0.6	yes
Basra	-0.6	yes

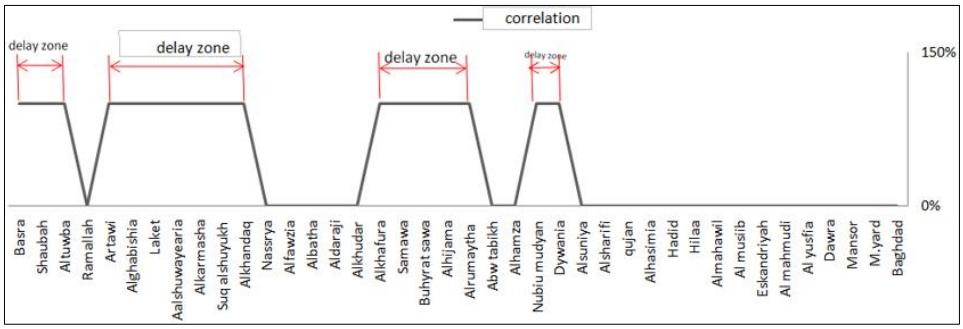

Fig. 1 Delay Zone Along the Train Track between Baghdad and Basra.

Table 5 Station Time Deviation Rate.

Station	Station time deviation rate
Dywania	-0.26
Nubiu mudyan	-0.26
Alrumaytha	1.99
Alhijama	2.90
Buhyrat sawa	3.81
Samawa	-1.07
Alkhafura	-1.60
Alkhandaq	-0.25
Suq alshuyukh	-0.22
Alkarmasha	-0.25
Aalshuwayearia	-0.24
Laket	-0.21
Alghabishia	-0.22
Artawi	-0.26
Altuwba	-0.27
Shaubah	-0.25
Basra	-0.23

Table 6 Accidents that Caused Delays.

Zone	Station	Causes	Repetition
Zone 1	Dywania	Establishing irregular crossings	28
		broken the glass of the wagon	25
	Nubiu mudyan	Establishing irregular crossings	12
		broken the glass of the wagon	11
Zone 2	Alrumaytha		
	Alhijama		
	Buhyrat sawa		
	Samawa	broken the glass of the wagon	23
		Parts stolen from train carriages	19
		train derailment	15
	Alkhafura		
Zone 3	Alkhandaq		
	Suq alshuyukh	broken the glass of the wagon	16
	Alkarmasha		
	Aalshuwayearia		
	Laket		
	Alghabishia	broken the glass of the wagon	13
		collision with animals	12
	Artawi		
Zone 4	Altuwba		
	Shaubah	train derailment	47
		broken the glass of the wagon	18
		Parts stolen from train carriages	15
	Basra	broken the glass of the wagon	32
		train derailment	18
		Train wagons detached	13

6.CONCLUSION

This study evaluates the performance quality of Iraqi railways. Four zones were monitored on the train track between Baghdad-Basra and Basra-Baghdad. In these four zones, there was a deviation in the periods planned for the arrival of the train to the stations, meaning that there is a defect in the performance of the train in these zones. To determine the causes of the deviation, the types of accidents that occurred in these stations have been studied. It was found that the most important accidents were the repeated ones. Note that there were other accidents, but they were unrepeated. The focus was on repeated incidents because their recurrence means there is a problem that must be resolved to prevent their recurrence. Some stations did not get frequent accidents to occur; however, comparing the times between the planned and the actual arrival of the locomotives to these stations, a deviation in time was found. The reason is the accumulation of deviation from the previous stations reflected on these stations, i.e., when treating the problems that caused the deviation in the previous stations, the deviation in this station will be automatically treated. The problems of frequent accidents at the stations can be solved by the following:

- Zone 1: including the stations Altuwba, Shaubah, and Basra, the most frequent accidents were establishing irregular crossings and breaking the glass of wagons, which can be handled by constructing suspended railways through the passage of trains in these two stations.
- Zone 2: including the stations Alrumaytha, Alhijama, Buhyrat Sawa, Samawa, and Alkhafura. It includes five stations, but only one of which was repeated in accidents and included these accidents: breaking the glass of a wagon, parts stolen from a train carriage, and train derailment. Train delinquency accidents were caused by stealing parts of the trains, which can be handled by constructing a protection fence on both sides of the railway tracks and equipped with a monitoring system to reduce theft and damage to trains.
- Zone 3: including the stations Alkhandaq, Suq Alshuyukh, Alkarmasha, Aalshuwayearia, Laket, Alghabishia, and Artawi. It includes seven stations, but only two had repeated accidents, such as broken wagon glass and collisions with animals, which can be handled by constructing a protection fence on both sides of the railway tracks.
- Zone 4: including the stations Altuwba, Shaubah, and Basra. It includes three stations, but only two of them which was repeated accidents, such as train derailments, broken wagons glass, and train wagons detached, which can be handled by constructing a protection fence on both sides of the railway tracks.

In addition, to follow up on the trains' progress and remedy the obstacles facing trains during trips, the researchers suggest implementing modern electronic systems and programs and electronic follow-up systems instead of the old system and paper documentation approved by the Quality Control Department of the Iraqi General Company for Railways.

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REFERENCES

[1] Flayeh MK. **Iraq's Transport Strategy**. *KnE Engineering* 2018; **3**(4):327 – 342.

[2] Yiqiu T, Qin L, Ismael I, Naser AF. **Performance Measures and Level of Transit Service Assessment of Public Transport Bus Network in Baghdad City during 2002-2003**, *Tikrit Journal of Engineering Sciences* 2021; **28**(3): 71-87.

[3] Mahajan VC, Rau SS. **an Empirical Study on Service Quality Perceptions of Domestic**. *Journal of Management Research and Analysis* 2009; **3**(2): 69–74.

[4] Wang Y, Shi Y. **Measuring the Service Quality of Urban Rail Transit Based on Interval-Valued Intuitionistic Fuzzy Model.** *KSCE Journal of Civil Engineering* 2020; **24**(2): 647–656.

[5] Eboli L, Fu Y, Mazzulla G. **Multilevel Comprehensive Evaluation of the Railway Service Quality**. *Procedia Engineering* 2016; **137**: 21–30.

[6] Alçura GA, Gündoğar SŞK, Tanrıverdi C, Şimşek GG, Gürsoy M. **Impact Score Technique and Servqual Comparison for Public Transportation Service Quality**. *Sigma Journal of Engineering and Natural Sciences* 2020; **38**(2): 715–726.

[7] Bakti IGMY, Rakhmawati T, Sumaedi S, Damayanti S. **Railway Commuter Line Passengers' Perceived Service Quality: Hedonic and Utilitarian Framework**. *Transportation Research Procedia* 2020; **48**: 207–217.

[8] Alam MS, Mondal M. **Assessment of Sanitation Service Quality in Urban Slums of Khulna City Based on SERVQUAL and AHP Model: A Case Study of Railway Slum, Khulna, Bangladesh**. *Journal of Urban Management* 2019; **8**(1): 20–27.

[9] Bhatnagar RV, Ram S. **Assessment of Level of Service for Access and Dispersal Facilities in a Railway Terminal**. *International Journal of Transportation Science and Technology* 2022; **11**(2): 344- 359.

[10] Enad MT. **The Reality of Railways in Iraq and Ways to Develop them**. *Journal of Education College / Wasit University* 2021; **1**(43): 211- 232.

[11] Iraq, central statistical organization. Railway statistics report for the year 2021. Ministry of Planning - Central Statistical Organization; 2021.

[12] Hamed MM, Shubber AA, Abudl Al Razzak TZ. **Evaluation of the Operational Speed for Iraqi Railways Using Geomatics Techniques**. *Engineering and Technology Journal* 2016; **34**(12):2249-2257.

[13] Giao HNK. **Measuring Service Quality in Construction Project Management Service at AIC Management Co., Ltd.-A Dimension-by-Dimension Analysis**. *International Journal of Applied Business and Economic Research* 2020; **16**(1): 165-175.