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Evaluation of Bridge Projects in Iraq Using International Performance Evaluation Standards (USAID)

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Abstract

This study evaluates the performance of bridge projects in Iraq using international performance evaluation standards set by USAID. The assessment focuses on two major bridge projects in Baghdad: the Bridge Project over the Army Canal and the Design and Implementation Project for developing the Shaljia and Tobji Intersection. The evaluation standards include relevance, efficiency, effectiveness, impact, and sustainability. Data collected from these projects were analyzed to measure performance against these standards. The results revealed significant gaps between both projects' expected and actual performance. The Bridge Project over the Army Canal showed moderate performance in relevance and sustainability but had substantial weaknesses in effectiveness. The Shaljia and Tobji, Intersection Development project, exhibited major weaknesses across all standards. The study concludes a critical need for better planning, improved resource utilization, enhanced stakeholder communication, and more effective monitoring and evaluation mechanisms to address these performance gaps and achieve desired project outcomes. These findings highlight the importance of adopting comprehensive and adaptable evaluation standards to improve the efficiency and effectiveness of infrastructure projects in Iraq. The research provides valuable insights for stakeholders involved in bridge projects, emphasizing the need for ongoing improvement in project management practices to ensure infrastructure reliability and safety.

Keywords: Bridge Projects, Performance Evaluation, Key Performance Indicators, USAID Standards, Project Management, Sustainability.

تقييم مشاريع الجسور في العراق باستخدام معايير تقييم الأداء الدولية(USAID)

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الخلاصة:

تقيم هذه الدراسة أداء مشاريع الجسور في العراق باستخدام معايير تقييم الأداء الدولية التي وضعتها الوكالة الأمريكية للتنمية الدولية. ويركز التقييم على مشروعين رئيسيين للجسور في بغداد: مشروع الجسر فوق قناة الجيش ومشروع تصميم وتنفيذ تطوير تقاطع الشالجية والطوبجي. وتشمل معايير التقييم الصلة والكفاءة والفعالية والتأثير والاستدامة. وتم تحليل البيانات التي تم جمعها من هذه المشاريع لقياس الأداء مقابل هذه المعايير. وكشفت النتائج عن فجوات كبيرة بين الأداء المتوقع والفعلي لكلا المشروعين. وأظهر مشروع الجسر فوق قناة الجيش أداءً معتدلاً من حيث الصلة والاستدامة ولكنه عانى من نقاط ضعف كبيرة في الفعالية. وأظهر مشروع تطوير تقاطع الشالجية والطوبجي نقاط ضعف رئيسية في جميع المعايير. وتخلص الدراسة إلى الحاجة الماسة إلى تخطيط أفضل، وتحسين استخدام الموارد، وتعزيز التواصل مع أصحاب المصلحة، وآليات مراقبة وتقييم أكثر فعالية لمعالجة هذه الفجوات في الأداء وتحقيق النتائج المرجوة للمشروع. وتسلط هذه النتائج الضوء على أهمية تبني معايير تقييم شاملة وقابلة للتكيف لتحسين كفاءة وفعالية مشاريع البنية التحتية في العراق. يقدم البحث رؤى قيمة لأصحاب المصلحة المشاركين في مشاريع الجسور، مع التأكيد على الحاجة إلى التحسين المستمر في ممارسات إدارة المشاريع لضمان موثوقية البنية التحتية وسلامته.

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1. Introduction

In infrastructure projects management, evaluating the performance of bridges is crucial to ensuring their economic lifespan and safety, and effective successful completion of a bridge project, particularly concerning minimizing effects on traffic flow, safety, and adjacent business activity. The optimization of such performance is, hence, desirable. However, designers lack objective tools with which to evaluate the effectiveness of their performance [1].

Bridge performance is currently described by unrelated measures, such as condition ratings and health indices, with no universal performance metrics. Despite having extensive inventory and condition data, understanding and measuring bridge performance remain suboptimal due to a lack of critical data and insufficient knowledge of cause-and-effect relationships. While bridge inspection standards and management tools are exemplary, efforts to assess performance are hindered by these limitations. [2].

Current bridge performance evaluation standards overlook aspects like structural safety, functional adequacy, and financial, and environmental sustainability. This underscores the need to update traditional standards. The absence of globally recognized, comprehensive standards is a major challenge for the engineering community. Developing adaptable, modern standards that align with current and future design needs is urgently required. [3].

United States Agency for International Development (USAID) developed a method for evaluating bridge projects using international performance evaluation standards, depending on five standards Correlation Standard (CS), Efficiency Standard (ES), Effectiveness Standard (EfS), Impact Standard (IS) and Sustainability Standard (SS), this approach adopting in the current study to provide scientific answers to three main questions:

1) How well are bridge projects performing in Iraq as a case study?
2) Have bridge projects achieved their objectives?
3) Does bridge projects meet the needs of stakeholder

This Study Aims to provide applicable evaluation standard that enhance the sustainability, efficiency, effectiveness, impact and sustainability of bridge projects in the Republic of Iraq, considering user safety, environmental impact, durability, and structural integrity. also, the proposed evaluation standards will be tested on a selected set of bridge projects to demonstrate the framework's applicability, reliability, and comprehensiveness in evaluating bridges projects performance.

2. Performance Evaluation of Bridge Projects

Bridges plays an important role in the daily mobilisation of goods and people. evaluation performance of this infrastructure is necessary to ensure its efficiency and safety, also, the main objectives of bridge performance evaluation are to ensure that the constructed bridges meet all the fundamental design, construction, and operational standards and criteria. Additionally, Inspecting and evaluating bridges is vital to ensuring their safety and efficiency. Various methods and techniques are used to assess a bridge's structural condition. Historical records and bridge data can be analysed to evaluate past performance and predict potential future deterioration [4].

Inspecting and evaluating bridges is vital to ensuring their safety and efficiency. Various methods and techniques are used to assess a bridge's structural condition. Historical records and bridge data can be analysed to evaluate past performance and predict potential future deterioration [5].

The establishment of clear performance measures can help agencies to assess the extent to which a bridge program, project, or policy has succeeded or is expected to succeed in achieving intended goals and objectives. Chosen properly, a set of performance measures can adequately describe the full consequences of competing bridge actions and thereby help identify the most desirable [6].

3. Key Performance Indicators

Defining Key Performance Indicators (KPIs) is essential in brideges project management. KPIs are based on the project's objectives and must be measurable, achievable, relevant to the project's subject, and time-bound. There are seven steps to implementing KPIs that help determine which KPIs to use, how to collect and manage information, and how to report results. These steps are determining what to measure, collecting data, calculating KPIs, reporting, analyzing, taking appropriate action, and measuring again [7].

Key Performance Indicators (KPIs) vary depending on what is being measured; therefore, their benefits differ from one construction project to another. What is measured in one construction project may not be measured in another, highlighting the importance of selecting appropriate KPIs to obtain accurate results that serve decision-makers, such as [8]:

1) Process-related KPIs: KPIs focus on how tasks are executed, measuring the performance of the individual responsible for the task and their adherence to set standards to achieve goals.
2) Leading KPIs: Leading KPIs impact the future workflow of the construction project. These indicators are usually used to predict changes in the project before they happen.
3) Lagging KPIs: Lagging KPIs measure the success or failure of the construction project after its completion, indicating how project goals were achieved.
4) Outcome KPIs: Outcome KPIs measure the ability to achieve the construction project's final goals. They differ from output-related indicators in that outcome indicators encompass all tasks in the project, while output-related indicators are limited to a single task.

Given the substantial differences between operational and research technical indicators, many researchers tried to find correlations between them. [9], as example, analyzed potential relationships between robustness and condition ratings of existing bridges, with the aim to correct rating with data

derived by robustness assessment to make it dependent on the system behavior. [10] proposed a condition-based approach describing lifetime deterioration of reinforced concrete (RC) bridge decks. The study evidenced how the combined use of condition and reliability indices is a powerful tool, especially when it is applied to RC bridge decks under corrosion. Furthermore, in the case of RC decks under corrosion, the correlation between condition and reliability was demonstrated. Load rating factor is also a commonly used operational performance indicator for bridge capacity and not only condition. [11] performed both a load rating analysis and a reliability analysis on the same highway bridge, concluding how a direct correlation between the two methods is lacking, since reliabilities are strongly dependent by assumed failure modes and load models, whereas load ratings do not account for redundancy in a structure or correlation between failure modes. In the research presented in [12], it was shown how routine visual information related to condition rating of composite highway bridges and used in the PONTIS bridge management system can be used to update the reliability of these bridges subject to corrosion, demonstrating a clear interaction between operational and research performance indicators.

The issue of bridge control and management has been significantly deepened in past and recent literature studies. But, significant efforts are still required in order to try to find reliable correlations between visual inspections and NDTs, as well as between the latter and probing outcomes, also, field of non-technical PIs as well as that of decision-making approaches are still little known among infrastructure owners, and currently no relevant research presents a detailed and comprehensive application of all technical, socio-environmental and economic PIs to a bridge case study. It is therefore strongly recommended to scientist dealing with research in bridge quality control and management to put efforts in developing case-study applications with a multidisciplinary approach in order to allow engineers and infrastructure owners to familiarize with such issues. And, Looking to the current state-of-research on this field, some considerations can be carried out with the aim to highlight present gaps and potential future research developments, therefore, current study used International Performance Evaluation Standards (USAID) in order to Evaluation of Bridge Projects in Iraq

4. Case Bridges projects

Research population consists of the first package of bridge projects in the Republic of Iraq, which are significant projects to establish a network of bridges across the country. The Iraqi Ministry of Construction, Housing, Municipalities, and Public Works launched this project in 2021 and is expected to continue until 2025. The project aims to improve the country's transportation infrastructure and facilitate traffic movement between cities and regions.

First package of bridge projects in Iraq includes 19 projects with a total cost of 1.634 billion Iraqi dinars and is scheduled to be completed within three years. These projects involve the construction of new bridges and the improvement of existing ones. The goals of these projects are to enhance traffic flow and alleviate traffic congestion in Iraq, create new job opportunities for Iraqis during the construction and operation phases, improve the standard of living by facilitating access to essential services and economic opportunities, and stimulate the economy by attracting investments and boosting trade.

Research sample was divided into two bridge projects in Baghdad, One is located on the Karkh side and the second on the Rusafa side, This equitable division allows for understanding the differences and similarities between projects in these areas, fostering a balanced perspective.

Project (No.1) is the design and implementation bridge project for the development of Al-Shaljia and Al-Tobji Intersection, it is part of the first package of projects aimed at alleviating traffic congestion. The goal of these projects is to significantly improve mobility and drastically reduce congestion in vital areas on the Karkh side of the capital, which are key intersections due to the high traffic volume they experience. Specifically, the project includes the construction of two U-turn bridges on 14th of July Street, each 1 km long, to facilitate traffic movement between 14th of July Street and 14th of Ramadan Street. Additionally, it involves the development of the Shaljia intersection by constructing a 280-meter-long bridge on 14th of July Street to more effectively channel traffic, as the example in Table 1., and Fig. 1.

Table (1): Information about Design and Implementation Bridge Project of Shaljia And Tobji Intersection

Planned Duration	**300 days**
Planned Cost	100 Billion IQD
Project Area	45600 m^2
Total Length	2280 m
Owner	Ministry of Construction, Housing and Public Municipalities/Office of Roads and Bridges
Consulting Entity	Khatib and Alami Company
Executing Entity	YDA Construction, Contracting, Industry, and Trade Company

Figure (1): Design and Implementation Project for Development of The Shaljia and Tobji Intersection.

While the project (No.2) is , design and implementation bridge project over the Army Canal connecting Al-Dakhil Street to Palestine Street (Al-

Muhandisin District), it is part of the first package of projects to reduce traffic congestion in Baghdad. The project consists of two main bridges over the Army Canal for both directions, with a length of 600 meters, including approaches, and a width of 16.5 meters for each bridge. Additionally, there will be a bridge over the canal with a length of 230 meters and a width of 21 meters to connect Al-Dakhil Street with the Engineers District, as the example in Table 2., and Figure 2.

Table (2): Information about Bridge Project Over the Army Canal to Connect Al-Dakhil Street with Palestine Street.

Planned Duration	***240 days***
Planned Cost	100 Billion IQ.D
Project Area	24630 m^2
Total Length	1430 m
Owner	Ministry of Construction, Housing and Public Municipalities/Office of Roads and Bridges
Consulting Entity	Khatib and Alami Company
Executing Entity	Danube and Emar Al-Badia Companies

Figure (2): Bridge Project Over the Army Canal to Connect Al-Dakhil Street with Palestine Street.

5. Application KPIs in Bridge Projects

To evaluate bridge projects in Iraq, it is essential to rely on specific standard, which are measurement tools that determine the level of performance according to defined dimensions of achievement. Each standard tests a set of indicators to show its effectiveness in managing and implementing the project. To ensure the success of any project, there are three essential standard pillars: cost, time, and quality. A successful project meets these three criteria according to the prepared plan [13].

Current study depended on approch for evaluating bridge projects using international project evaluation standards by United States Agency for International Development (USAID), which include five standards, firstly is called Connectivity Standard (CS), second is called Efficiency Standard (ES), third is called Effectiveness Standard (EfS), forth is called Impact Standard (IS), and finally, fifth is called Sustainability Standard (SS), these five evaluation standard were applied to the case- study as follows:

First: Bridge Project Over Army Canal to Connect Al-Dakhil Street with Palestine Street.

1) Connectivity Standard (CS): Table (3) outlines the elements of the connectivity standard, and the results derived from project consultant, Khatib & Alami, are as follows:

Table (3): Evaluation Results for Connectivity Standard (CS)

No.	***Performance Evaluation Items***	***Performance Evaluation Score***				
		1	***2***	***3***	***4***	***5***
A	Connectivity Standard(CS): This standard examines the extent to which the results are relevant and aligned with the needs, policies, and priorities of the target groups of the project.					
1	identification of the target groups of the project and the partners (stakeholders) involved.			✔		
2	Identification of the real problems of the target groups and determination of their needs.			✔		
3	Analysis of lessons learned from previous experiences (projects).			✔		
4	Design the project to solve the problems of the target groups and meet their needs			✔		
5	Analysis of external risks that might be encountered during project implementation					✔
6	Establish arrangements for coordination with partners			✔		
7	Establish an appropriate and effective monitoring and evaluation system.				✔	
Weights		1	2	3	4	5
Frequencies		0	0	5	1	1
Result		0	0	15	4	5
Total					24	
Average = Total Result of Field Questions / Number of Items					3.4	
Percentage = Total Calculated Final Result / (Highest Weight × Number of Items)					68.6 %	
Gap Amount = 100 – Percentage					31.4%	

*1 = Unsatisfactory, 2 = Marginal, 3 = Meets Requirements, 4 = Exceeds Requirements, 5 = Exceptional.

It is evident from Table 3 that the gap value for the Connectivity Standard (CS) is 31.4%, this percentage represents the difference between the relevance-related objectives that the project was supposed to achieve and what has actually been achieved, also, it is indicates

significant challenges in achieving full alignment between the project and its stated objectives, this could mean that the planning or execution was not at the required level to ensure effective alignment between all elements and activities of the project, or that the objectives were not clear or detailed enough to guide efforts effectively.

From the researcher's perspective, to reduce this gap, it is important to improve communication and coordination among all stakeholders to ensure a shared understanding and continuous achievement of objectives, re-evaluate and update the objectives based on current data and project progress, and use specific and measurable performance indicators to track the progress of alignment and assess the effectiveness of the actions taken.

2) Efficiency Standard (ES): Table (4) shows the elements of The Efficiency Standard (ES), and this results derived from Project Consultant, Khatib & Alami, are as follows:

Table (4): Evaluation Results for Efficiency Standard (ES)

No.	*Performance Evaluation Items*	*Performance Evaluation Score*				
		1	*2*	*3*	*4*	*5*
B	Efficiency Standard(ES): This standard evaluating of the results achieved in relation to the expenses and resources used in the project during a specified time period, It also illustrates the extent to which input resources have been transformed into the targeted outputs, both qualitatively and quantitatively, within the specified timeframe.					
1	Extent to which the planned project outputs have been achieved.			✔		
2	Quality of daily management, including the management of budget, time, staff, information, and risks.				✔	
3	Costs of the project outputs compared to what was planned.			✔		
4	Quality of monitoring, whether it exists or not, and whether it is utilized effectively.			✔		
5	Verifying whether any unintended results have been achieved or not.					✔
Weights		1	2	3	4	5
Frequencies		0	0	3	1	1
Result		0	0	9	4	5
Total					18	

Average = Total Result of Field Questions / Number of Questions	3.6
Percentage = Total Calculated Final Result / (Highest Weight × Number of Items)	%72
Gap Amount = 100 – Percentage	%28

From Table 4., evident that the gap value of Efficiency Standard (ES) for the Bridge Project Over Army Canal to Connect Al-Dakhil Street with Palestine Street was 28%, this value indicates the difference between the expected efficiency and the efficiency that was actually achieved, a gap of 28% is an indicator of significant challenges in achieving the desired efficiency standards for the project. This difference may point to inefficiencies in resource utilization, execution delays, or possibly a lack of effective responsiveness to the challenges encountered during the project.

From the researcher's perspective, to address this gap, it is important to conduct a comprehensive evaluation of current processes to identify the weaknesses that led to this performance, improve processes and procedures to enhance efficiency, possibly through better planning or the use of more advanced technologies, increase training and support for working teams to ensure tasks are carried out more efficiently, and enhance continuous monitoring and evaluation of performance to ensure ongoing improvement and the achievement of desired objectives.

3) Effectiveness Standard (EfS): Table (5) Outlines the elements of Effectiveness Standard, there four element, were as Follows:

Table (5): Evaluation Results for Effectiveness Standard (EfS)

No.	*Performance Evaluation Items*	*Performance Evaluation Score*				
		1	*2*	*3*	*4*	*5*
G	Effectiveness Standard(EfS): This standard focuses on assessing the extent to which the outputs have been achieved or are likely to be achieved, and whether the project is likely to contribute to specified outcomes or impacts.					
1	Extent to which the specified planned objectives have been achieved.			✔		
2	Extent to which the planned changes, development, and benefits for the target groups have been achieved.		✔			
3	Whether the potential risks were correctly identified and whether any new risks emerged.		✔			
4	Whether any problems arose due to the failure to consider cross-cutting issues.		✔			

Weights	1	2	3	4	5
Frequencies	0	3	1	0	0
Result	0	6	3	0	0
Total				9	
Average = Total Result of Field Questions / Number of Questions				2.3	
Percentage = Total Calculated Final Result / (Highest Weight × Number of Items)				%45	
Gap Amount = 100 – Percentage				%55	

Value of gap for Effectiveness Standard (EfS) equal to 55%, as shwon in Table 5., this percentage represents the difference between the expected effectiveness objectives of the project and what has actually been achieved. also, this gap of this big percentage indicates that the project did not come close to achieving its objectives with the expected effectiveness. This may stem from several issues such as inefficient use of resources, significant execution delays, or inadequate planning and management to overcome the challenges faced by the project.

From the researcher's perspective, to address this gap, it is important to conduct a comprehensive evaluation of the root causes that led to this performance, improve project planning and management to ensure resources are utilized in the most effective ways, enhance communication and coordination among teams to ensure effective implementation of activities, and reconsider the objectives to make them more realistic and appropriate for the available resources and conditions.

4) Impact Standard: Table (6) Outlines the Elements of the Impact Standard, and the Results Derived from the Project Consultant, Khatib & Alami, are as follows:

Table (6): Evaluation Results for Impact Standard (IS)

No.	*Performance Evaluation Item*	*Performance Evaluation Score*				
		1	*2*	*3*	*4*	*5*
D	Impact Standard: This standard examines the long-term impact of the project and the success of its implementation and performance. It also reflects the extent to which the benefits received by the target groups have spread to a larger number of people in the community.					
1	The extent to which the overall goal of the project has been achieved.			✔		
2	The extent of the project's economic impact on the citizens.				✔	
3	The extent to which the project has contributed to the development of the construction sector.			✔		
4	Documenting success stories, lessons learned, and innovative aspects of the project.		✔			

Weights	1	2	3	4	5
Frequencies	0	1	2	1	0
Result	0	2	6	4	0
Total	12				
Average = Total Result of Field Questions / Number of Questions	3				
Percentage = Total Calculated Final Result / (Highest Weight × Number of Items)	%60				
Gap Amount = 100 – Percentage	%40				

It is evident from Table (6) that the gap value for the impact standard for the Overpass Project on the Army Canal to Connect Al-Dakhil Street with Palestine Street (Engineers' District) is 40%. This percentage indicates a significant difference between the expected impact and the actual impact achieved in the project.

A gap of 40% is significant and indicates substantial challenges in achieving the desired impact of the project. This suggests that the results achieved were not at the expected level and that the project did not fully succeed in meeting its social, environmental, or economic objectives.

From the researcher's perspective, to reduce this gap, it is necessary to re-evaluate the goals and strategies related to impact to ensure they are realistic and achievable within existing constraints, enhance monitoring and evaluation processes to ensure that every activity directly contributes to achieving the desired impact, improve communication and interaction with beneficiary communities to understand the project's impact on them and receive feedback on how to improve these impacts and consider providing additional training or resources to the implementation teams to increase their efficiency in achieving the desired objectives.

5) Sustainability Criterion: Table (7) Outlines the Elements of the Sustainability Standard, and the Results Derived from the Project Consultant, Khatib & Alami, as follows:

Table (7): Evaluation Results for Sustainability Standard (SS)

No.	*Performance Evaluation Items*	*Performance Evaluation Score*				
		1	*2*	*3*	*4*	*5*
H	Sustainability Standard (SS): This Standard reflects whether the benefits for the target groups will continue after the external funding ends and assesses the likelihood of the results continuing or their potential to be sustained after the project's completion.					
1	Extent to which partners understand the project's objectives.			✔		

2	Adequacy of the project budget to achieve the project's outputs and objectives.			✔		
3	Alignment of the project's objectives with the community's needs.			✔		
4	Ability to manage the available technology in the project's development.				✔	
5	Project's sustainability after its completion.					✔
6	Level of the company's commitment to continuing its projects.				✔	
7	Target groups' ability to bear the cost of services provided after the funding ends.			✔		
Weights		1	2	3	4	5
Frequencies		0	0	4	2	1
Result		0	0	12	8	5
Total					25	
Average = Total Result of Field Questions / Number of Questions					3.6	
Percentage = Total Calculated Final Result / (Highest Weight × Number of Items)					%71.4	
Gap Amount = 100 – Percentage					%28.6	

It is evident from Table 7, that the gap value for the sustainability standard was 28.6%. This percentage indicates the difference between the expected sustainability objectives of the project and what has actually been achieved. A gap of 28.6% is an indicator of significant challenges in achieving the desired sustainability. This could mean several things, such as inadequate consideration of environmental, social, or economic factors in planning and execution, or that the sustainable activities were not effective enough to meet the established standards.

From the researcher's perspective, to reduce this gap, it is important to enhance environmental, social, and economic considerations within the project to ensure long-term positive impact, improve continuous monitoring and evaluation of sustainability-related activities to ensure ongoing improvement and address any emerging issues, increase awareness and training among project teams regarding the importance of sustainability and how to achieve it effectively and improve communication with all stakeholders, including local communities and stakeholders, to ensure their support and participation in achieving sustainability objectives.

Finally, Table 8., summarizes the performance evaluation standard results for the bridge project over the Army Canal to Connect Al-Dakhil Street with Palestine Street, with the final percentage score for the evaluation being 63.4% and the final gap value being 36.6%.

Table 8: Summary of Performance Standard Scores for Bridge Project over Army Canal to Connect Al-Dakhil Street with Palestine Street.

International Performance Evaluation Standards (USAID)	***Percentage Score for Evaluation (%)***	***Gap Value (%)***
Connectivity Standard	68.6	31.4
Efficiency standard	72	28
Effectiveness Standard	45	55
Impact Standard	60	40
Sustainability Standard	71.4	28.6
Final Score	63.4	36.6

Second: Design and Implementation Project for The Development of The Shaljia and Tobji Intersection

1) Connectivity Standard (CS): Table (9) Outlines the elements of the connectivity standard, and the results derived from the project consultant, khatib & alami, are as follows:

Table (9): Evaluation Results for Connectivity Standard (CS)

No.	**Performance Evaluation Items**	**Performance Evaluation Score**				
		1	**2**	**3**	**4**	**5**
A	Connectivity Standard(CS): This standard examines the extent to which the results are relevant and aligned with the needs, policies, and priorities of the target groups of the project.					
1	Identification of the Target Groups of the Project and the Partners (Stakeholders) Involved.			✔		
2	Identification of the Real Problems of the Target Groups and Determination of Their Needs.			✔		
3	Analysis of Lessons Learned from Previous Experiences (Projects).			✔		
4	Design the Project to Solve the Problems of the Target Groups and Meet Their Needs			✔		
5	Analysis of External Risks That Might Be Encountered During Project Implementation			✔		
6	Establish Arrangements for Coordination with Partners			✔		

7	Establish an Appropriate and Effective Monitoring and Evaluation System.			✔		
Weights		1	2	3	4	5
Frequencies		0	0	7	0	0
Result		0	0	21	0	0
Total					21	
Average = Total Result of Field Questions / Number of Questions					3	
Percentage = Total Calculated Final Result / (Highest Weight × Number of Items)					%60	
Gap Amount = 100 – Percentage					%40	

It is evident from Table 9 that the gap value for the relevance standard for the design and implementation project for the development of the Shaljia and Tobji Intersection is 40%. This percentage reflects the difference between the expected relevance objectives and what has actually been achieved, indicating significant challenges in fully aligning the project with its objectives.

A gap of 40% indicates a significant shortfall in achieving the project's expected objectives and highlights the need for substantial improvements in how activities align with overall goals. This may stem from inadequate planning, ineffective execution, or insufficient communication between teams and departments.

From the researcher's perspective, to address this gap, it is important to improve internal and external communication to ensure a clear and shared understanding of the project's objectives among all stakeholders, enhance coordination and collaboration mechanisms between teams to ensure all activities directly contribute to achieving the objectives and re-evaluate the objectives to determine if they are realistic and achievable under current conditions and adjust them if necessary.

2) Efficiency Standard (ES): Table (10) Outlines the Elements of The Efficiency standard, and the Results Derived from The Project Consultant, Khatib & Alami, as follows:

Table (10): Evaluation Results for Efficiency Standard (ES)

No.	***Performance Evaluation Items***	***Performance Evaluation Score***				
		1	***2***	***3***	***4***	***5***
B	Efficiency Standard (ES): This standard evaluates the results achieved in relation to the expenses and resources used in the project during a specified time period. It also illustrates the extent to which input resources have been transformed into the targeted outputs, both qualitatively and quantitatively, within the specified timeframe.					
1	The extent to which the planned project outputs have been achieved.			✔		
2	The quality of daily management, including the management of budget, time, staff, information, and risks.		✔			
3	The costs of the project outputs compared to what was planned.			✔		
4	The quality of monitoring, whether it exists or not, and whether it is utilized effectively.			✔		
5	Verifying whether any unintended results have been achieved or not.			✔		
Weights		1	2	3	4	5
Frequencies		0	1	4	0	0
Result		0	0	12	0	0
Total					14	
Average = Total Result of Field Questions / Number of Questions					2.8	
Percentage = Total Calculated Final Result / (Highest Weight × Number of Items)					%56	
Gap Amount = 100 – Percentage					%44	

It is evident from Table 10 that the gap value for the efficiency standard for the Design and Implementation Project for the Development of the Shaljia and Tobji Intersection is 44%. This percentage represents the difference between the expected efficiency and the actual efficiency achieved, indicating significant challenges in reaching the desired levels of efficiency.

A gap of 44% indicates that the project was unable to achieve nearly half of the required efficiency. This means inefficiency in resource utilization, execution delays, or possibly a mismatch between expectations and reality that impacts the project's effectiveness. There may be weaknesses in supervision, execution, or inadequate planning for resources and the timeline.

From the researcher's perspective, to address this gap, it is important to conduct a comprehensive evaluation of the current processes to identify the weaknesses that led to this performance, improve processes and procedures to enhance efficiency, possibly through better planning or the use of more advanced technologies, increase training and support for working teams to ensure tasks are carried out more efficiently, and enhance continuous monitoring and evaluation of performance to ensure ongoing improvement and the achievement of desired objectives.

3) Effectiveness Standard (EfS): Table (11) Outlines the Elements of The Effectiveness standard, and the Results Derived from The Project Consultant, Khatib & Alami, As Follows:

Table (11): Evaluation Results for Efficiency Standard (ES)

No.	*Performance Evaluation Items*	*Performance Evaluation Score*				
		1	*2*	*3*	*4*	*5*
G	Effectiveness Standard (EfS): This standard focuses on assessing the extent to which the outputs have been achieved or are likely to be achieved, and whether the project is likely to contribute to the specified outcomes or impacts.					
1	The extent to which the specified planned objectives have been achieved.			✔		
2	The extent to which the planned changes, development, and benefits for the target groups have been achieved.			✔		
3	Whether the potential risks were correctly identified and whether any new risks emerged.		✔			
4	Whether any problems arose due to the failure to consider cross-cutting issues.	✔				
Weights		1	2	3	4	5
Frequencies		1	1	2	0	0
Result		1	2	6	0	0
Total					9	
Average = Total Result of Field Questions / Number of Questions					2.3	
Percentage = Total Calculated Final Result / (Highest Weight × Number of Items)					%45	
Gap Amount = 100 – Percentage					%55	

It is evident from Table 11 that the gap value for the effectiveness standard for the Design and Implementation Project for the Development of the Shaljia and Tobji Intersection is 55%. This percentage indicates a significant difference between the expected effectiveness of the project and what has actually been achieved, reflecting substantial challenges in achieving the objectives in the optimal way.

A gap of 55% indicates that there are significant areas for improvement in the management and execution of the project. The reasons behind this gap could be varied, including a lack of resources, inadequate planning, inefficient management, or unexpected challenges faced by the project.

From the researcher's perspective, to address this gap, it is important to conduct a comprehensive evaluation of the root causes that led to this performance, improve project planning and management to ensure resources are utilized in the most effective ways, enhance communication and coordination among teams to ensure effective implementation of activities, and reconsider the objectives to make them more realistic and appropriate for the available resources and conditions.

4) Impact Standard(IS): Table (12) Outlines the Elements of The Impact standad, and the Results Derived from the Project Consultant, Khatib & Alami, As Follows:

Table (12): Evaluation Results for Impact Standard (IS)

No.	*Performance Evaluation Items*	*Performance Evaluation Score*				
		1	2	3	4	5
D	Impact standard(IS): This standard examines the long-term impact of the project and the success of its implementation and performance. It also reflects the extent to which the benefits received by the target groups have spread to a larger number of people in the community.					
1	The extent to which the overall goal of the project has been achieved.			✔		
2	The extent of the project's economic impact on the citizens.			✔		
3	The extent to which the project has contributed to the development of the construction sector.			✔		
4	Documenting success stories, lessons learned, and innovative aspects of the project.			✔		
Weights		1	2	3	4	5
Frequencies		0	0	4	0	0
Result		0	0	12	0	0
Total					12	

Average = Total Result of Field Questions / Number of Questions	3
Percentage = Total Calculated Final Result / (Highest Weight × Number of Items)	%60
Gap Amount = 100 – Percentage	%40

It is evident from Table 12 that the gap value for the impact standard for the Design and Implementation Project for the Development of the Shaljia and Tobji Intersection is 40%. This percentage represents the difference between the expected impact of the project and what has actually been achieved, indicating significant challenges in achieving the desired results.

A gap of 40% is significant and warrants attention as it indicates that the project did not achieve a substantial portion of its intended impact. This could be due to several factors such as inefficiency in executing activities, inadequate planning, or failure to effectively monitor and evaluate the impacts.

From the researcher's perspective, to reduce this gap, it is important to conduct thorough evaluations to identify the root causes of not achieving the desired impact, consider re-planning or adjusting project activities based on lessons learned and feedback from beneficiaries and participants, ensure greater engagement with target communities to better understand their needs and adjust activities to meet these needs more effectively, and enhance project monitoring and evaluation processes to provide real-time data on progress and challenges faced by the project.

5) Sustainability Standard (SS): Table (13) Outlines the Elements of The Sustainability Standard, and the Results Derived from The Project Consultant, Khatib & Alami, As Follows:

Table (13): Evaluation Results for Sustainability Standard (SS)

No.	***Performance Evaluation Items***	***Performance Evaluation Score***				
		1	2	3	4	5
H	Sustainability Standard(SS): This standard reflects whether the benefits for the target groups will continue after the external funding ends and assesses the likelihood of the results continuing or their potential to be sustained after the project's completion.					
1	The extent to which partners understand the project's objectives.			✔		
2	The adequacy of the project budget to achieve the project's outputs and objectives.		✔			
3	The alignment of the project's objectives with the community's needs.			✔		
4	The ability to manage the available technology in the project's development.			✔		
5	The project's sustainability after its completion.			✔		
6	The level of the company's (institution's) commitment to continuing its projects.			✔		
7	The target groups' ability to bear the cost of services provided after the funding ends.		✔			
Weights		1	2	3	4	5
Frequencies		0	2	5	0	0
Result		0	4	15	0	0
Total					19	
Average = Total Result of Field Questions / Number of Questions					2.7	
Percentage = Total Calculated Final Result / (Highest Weight × Number of Items)					%54.3	
Gap Amount = 100 – Percentage					%45.7	

It is evident from Table 13 that the gap value for the sustainability standard for the Design and Implementation Project for the Development of the Shaljia and Tobji Intersection is 45.7%. This percentage represents the difference between the expected sustainability objectives of the project and what has actually been achieved.

A gap of 45.7% is an indication that the efforts made to achieve project sustainability were insufficient. This may be due to inadequate consideration of environmental, social, or economic factors in planning and execution, or the failure to effectively implement sustainable strategies.

From the researcher's perspective, to reduce this gap and improve performance in the sustainability standard, it is important to identify areas for improvement in the current sustainability plans and adjust them to achieve more realistic and effective goals, ensure that all project participants understand the importance of sustainability and adopt the necessary practices to achieve it, use more effective monitoring tools to periodically evaluate performance and ensure alignment with set goals, and enhance communication with all stakeholders and local communities to ensure their support and active participation in achieving sustainability.

Finally, Table 14 summarizes the performance evaluation standard results for the Design and Implementation Project for the Development of the Shaljia and Tobji Intersection, with the final percentage score for the evaluation being 55% and the final gap value being 44.94%.

Table (14): Summary of Performance Standard Scores for Design and Implementation Project for The Development of The Shaljia and Tobji Intersection

International Standards for Evaluating Overpass Projects	***Percentage Score for Evaluation (%)***	***Gap Value (%)***
Connectivity Standard	60	40
Efficiency sta	56	44
Effectiveness Standard	45	55
Impact Standard	60	40
Sustainability Standard	54.3	45.7
Final Score	55	44.94

Table 14 shwos the compares the final percentage scores for evaluation and the gap values in performance or achievement for two bridges projects in Iraq, rank of these projects based on evaluation scores and corresponding gap values, where the evaluation score (%) and the gap value (%) indicate the following:

a) **Evaluation Score (%):** This measure represents the percentage evaluation of the project's performance, indicating the effectiveness and quality of project execution.

b) **Gap Value (%):** This measure represents the percentage difference between the expected performance and the actual performance, indicating the extent of the project's performance shortfall.

Table 15 shows Strengths and Weaknesses of Each of The Two bridges Projects.

Table(15): Final Score for Both the Gap Value and The Percentage for Evaluation.

No	***Project***	***Final Percentage Score for Evaluation(%)***	***Final Gap Value (%)***
1	Bridge Project Over Army Canal to Connect Al-Dakhil Street with Palestine Street.	63.4	36.6
2	Design and Implementation Project for The Development of The Shaljia and Tobji Intersection	55	44.94

Table (16): Strengths and Weaknesses of Each of The Two bridges Projects.

No	**Project Name**	**Strength Point**	**Weaknesses**
1	Bridge Project Over Army Canal to Connect Al-Dakhil Street with Palestine Street.	Average in efficiency and sustainability standards	Significant weakness in effectiveness standard
2	Design and Implementation Project for The Development of The Shaljia and Tobji Intersection	No notable strengths	Major weakness in all standards

6. Conclusion

Study evaluates bridge projects in Iraq using international performance evaluation standards (USAID). Evaluation standards include relevance, efficiency, effectiveness, impact, and sustainability. Data was collected from bridge projects in Baghdad, specifically focusing on two main projects: Bridge Project over the Army Canal and Design and Implementation Project for the Development of Shaljia and Tobji Intersection. Study applied USAID's evaluation criteria to assess these projects.

Performance evaluation revealed significant gaps between both bridge projects' expected and actual performance. Bridge Project over the Army Canal performed moderately in relevance and sustainability but showed weaknesses in effectiveness. Shaljia and Tobji, Intersection Development project, exhibited major weaknesses across all standards. Study highlights the need for better planning, improved resource utilization, enhanced stakeholder communication, and more effective monitoring and evaluation mechanisms to bridge these gaps and achieve the desired project outcomes.

Conflict of Interest

Authors declare No conflict of interest.

Data Availability

The data used in this research are available for academics., and, the compiled data will be made available on reasonable request to the corresponding author.

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Author contribution

A Faiq M. S. Al-Zwainy conceptualized the idea. Maryam G.S. Al-khazrajy collected the data and executed the work. Gasim Hayder prepared the draft version. and Sherif Mohamed revised the article draft. Faiq M. S. Al-Zwainy supervised the work. All the authors approved this version of the manuscript.

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