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Factors Affecting the Performance of Educational Projects

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ABSTRACT

Governments allocate large sums of money annually to establish educational projects such as schools, given the importance of the education sector in the development of society. However, most of these projects suffer from poor performance. This research aims to identify the most important factors that affect educational projects in order to improve their performance and make them a suitable environment for education. Through a review of previous literature, a questionnaire was prepared to obtain the required data, which included five main categories covering a range of factors that affect performance. It was distributed to a number of specialized engineers, with different academic degrees and job titles, working in the educational buildings sector. After obtaining the results from 49 respondents and processing them using SPSS-BIM version 23, and calculating the relative importance index, it was found that the factors falling under the categories of "project manager" and "planning" were among the most influential factors in project performance. The most influential factors in each category were as follows: Project manager: Inefficiency, poor management, slow decision-making; senior management: Funding versus work completed, management support, hostile environment; planning: Weak and unstable, non-compliance with contract terms, changes in design and quantities; site: availability of skilled labour, construction methods, coordination between parties, machine setup, construction errors, material-related factors, and human resource experience and training; Monitoring and evaluation: issues related to monitoring and evaluation budgets and planning for monitoring and evaluation. Based on the results, a framework was developed to improve the performance of educational projects.

Keywords: Improving project performance, Educational projects, Relative importance index (RII).

1. INTRODUCTION

A construction project is defined as a specific, time-bound, high-value task, with predefined objectives, quality specifications, completion time, budgeted cost, and other specific constraints, to provide a construction service or to create a facility **(Christian et al., 2022)**.

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Performance is the effectiveness and/or efficiency with which work is performed. There are many terms associated with performance, such as performance management, which is a set of cultural and behavioral metrics, through which we determine how to use performance measurement systems to manage the performance of organizations **(Bititci et al., 2018)**. The success of the project is the basis for guiding any future project, and for controlling and managing the current project **(Chovichien and Nguyen, 2013)**. Effective project management optimizes resources, manages risks, and adheres to schedule and budget. Meeting time, quality and cost standards, as well as optimizing resource management for organizational capability, is considered project success **(Kerzner, 2025)**. Using outdated project management techniques and methods can negatively impact project management performance **(Al Saffar et al., 2014)**.

It is now important for the government and stakeholders to analyses the factors that most affect the financial aspect of a construction company, so that adequate decisions can be made to improve any construction activity **(Soewin and Chinda, 2022)**. Cost management involves estimation, planning, control and budgeting **(Loiro et al., 2019)**. The researcher stated that financial indicators have a significant impact on the performance of construction companies **(Tofan and Breesam, 2018)**. Financial performance is one of the most important aspects to focus on, there are five important factors that provide information regarding a company's financial performance: Business Efficiency, Investor Return, Risk Cover; age, Activity Efficiency, Asset Management, Operations Management, These factors help stakeholders and the company in its operations and strategy planning **(Vibhakar et al., 2023)**. **(Chen et al., 2012)** conducted a study to evaluate corporate performance, based on which the researchers identified a set of financial analysis indicators: Profitability, Growth, Financial Fit, and Business Efficiency. Project cost and time performance is influenced by the performance of the project team, the characteristics (project, client and contractor), and the procurement system **(Ahsan and Gunawan, 2010; Del Pico, 2023)**.

Completing the project on time is one of the most important indicators of project success **(Reda and Mahomad, 2022).** There are many researchers who have addressed the factors that delay projects in the public and private sectors **(Shakir and Mohammed, 2022)**. Sometimes there is a delay in completing construction project activities, more than the specified period **(Oshungade, 2016)**. Another study showed that each construction project has a pre-determined duration, meaning that the project must be completed within the specified period or less **(Del Pico, 2023)**. A study has identified the main reasons for project delays in Iraq: Lack of expertise among contractor staff, delays in obtaining fee approvals, bad reputation and corruption for consultants, and misunderstandings and miscommunication with project stakeholders **(Al-taie, 2016)**. The researcher concluded that the reasons for delays in most construction projects in Iraq are: insufficient financial allocations, discrepancies in design drawings, contracting with incompetent contractors, lack of financial capacity of contractors during the implementation phase, lack of a schedule for supplying building materials, breakdown or obsolescence of construction equipment during operation, unskilled or unqualified labor, and economic crises in the country during the implementation of the construction project **(Mohammed and Jasim, 2017)**. Therefore, it is necessary to apply time management, as the work can be done well, and the project activities can be completed within the previously specified period or less **(Zunaidah et al., 2024)**. According to a survey involving 112 participants, the most important factors for success in time performance were: senior management and supportive staff, the competence of project managers, and feedback **(Del Pico, 2023)**. Researchers believe that it is necessary

to manage time using an appropriate tool such as critical path analysis, Gantt charts, or others **(Loiro et al., 2019)**.

To identify the most important factors affecting quality, the results showed that the three most important factors are: management commitment, employee participation and cooperation, and a skilled workforce. The three most important indicators are: management commitment to quality, customer satisfaction, return requests, and overtime **(Del Pico, 2023)**. Inter-organizational interactions, ineffective use of information technology, lack of quality systems, design changes, and contractor selection significantly affect the quality of a construction project **(Alwaer and Clements-Croome, 2010**; **Love et al., 2010)**. Incomplete design work also affects the project's performance later on, as professional integrity and credibility are the most important things when choosing a design consultant Incomplete design work also affects the project's performance later on, as professional integrity and credibility are the most important things when choosing a design consultant **(Alkaabi and Mahjoob, 2022)**.

There are other aspects, beyond the three well-known objectives (time, quality, and cost), that influence project performance. Most governments involved in most construction projects in developing countries and have 5 objectives that they try to achieve: Effectiveness, Efficiency, Relevance, Sustainability, Impact, which are considered as important pillars in community development projects **(Ika et al., 2012)**. A study identified a set of critical success factors that are important to evaluate the success of the project: Project planning, realistic and clear objectives, value, uniqueness and complexity, precise and clear purpose/objective for the client. Other human factors are the project manager's expertise, previous experience, team/project management competence, and the customer's ability to make a decision in a timely manner **(Gudienė et al., 2014)**. Critical success factors affecting project performance include: Design Management, Technical Factors, and Substantive Management **(Ogwueleka, 2012)**. Some studies have focused on the influence of stakeholders on construction project performance, where every project has multiple and complex functions, with different stakeholders influencing or being influenced by the project. The success of a project can be determined by the value that stakeholders perceive it creates. Therefore, each stakeholder should have a personalized strategy, according to their interest and power **(Radujković and Sjekavica, 2017)**. Researchers considered that it is important to consider safety issues in the output of construction projects **(Heravi and Ilbeigi, 2012)**. A study to evaluate the performance of housing projects has shown that strict supervision by supervisors during the implementation phase is one of the things that maintains the high performance of the project **(Erzaij and Aljanabei, 2016)**.

In order to achieve the business objectives, researchers believe that it is necessary to maintain the construction site with a lower level of conflicts **(Tabish and Jha, 2011)**. Another study showed the need to incorporate the physical, economic and social environment of the construction site into the performance of the project **(Gangolells et al., 2011)**. The most important factors that determine the performance criterion (minimum on-site conflicts) are: Owners' identification and comprehensive understanding, adequate communication between participants, regular monitoring and feedback to senior management, timely decision-making by senior management and adequate provision of resources **(Tabish and Jha, 2011)**.

The study aims to identify the most important factors that affect the performance of construction projects within the five categories summarised by the researcher. The study focused on governmental educational buildings that have not been adequately addressed in

previous research, as the research addressed specific categories that include a set of factors for each category, such as monitoring and evaluation, which are often not focused on factors related to project performance, in order to improve project performance and eliminate cost, quality, and time overruns.

2. METHODOLOGY

To achieve the research objectives, a literature review was conducted, and after collecting a set of data related to the performance of construction projects, a field questionnaire was conducted, which is considered one of the most common methods for collecting non-quantitative data from the community in two stages:

2.1 Open-ended Questionnaire

The initial questionnaire was discussed with a group of experts to determine the clarity and accuracy of the questions asked, and some modifications were made to suit the understanding of the study sample and to serve the research.

2.2 Closed Questionnaire

After making amendments to the questionnaire, in the first stage, the final questionnaire was distributed in paper and electronic form to a group of engineers, in different disciplines with at least (5) years of experience, working in educational institutions in Iraq mostly, and in different positions, the sample size exceeded (30) people, which is consistent with statistical theories, including the central limit theory, where (55) questionnaires were returned, (6) forms were discarded for not meeting the requirements, and (49) copies were approved.
The questionnaire consisted of two sections. The first section included a set of personal information about the respondents, as shown in **Figs. 1 and 2**, and **Table 1** in the supplementary materials. The second section included a question that included a set of factors that affect the performance of construction projects. Through this question, the researcher sought to determine what is needed to improve project performance by drawing on the respondents' experience. To determine the extent of the impact of these factors, a five-point Likert scale was used (very important = 5, important = 4, average = 3, little = 2, rare = 1). The five-point Likert scale is one of the most widely used scales in academic studies due to its clarity and quick response. The use of other scales (7, 9) may confuse respondents, while the use of fewer scales (3) may restrict respondents.

3. RESULTS AND DISCUSSION

After entering and processing the data using SPSS version 23, one of the most widely used programs for questionnaire data analysis **(Burhan et al., 2021)**, the results were obtained, as shown in **Table 3** below. The relative importance index (RII) was calculated, which is considered one of the most widely used methods for calculating importance **(Hasan and Mahomad, 2020; Hamza et al., 2022; Hasan and Mahomad, 2022; Sahib et al., 2023)** using Eq. 1 below. Cronbach's reliability coefficient was calculated for **Table 3**, with a value of 0.881, reflecting high internal consistency and reliability.

$$RII = \frac{\sum_{i=1}^{n} Fi*Wi}{(A*N)} \quad (1)$$

RII: The Relative Importance Index.
F: Factor frequencies
W: Using a five-point Likert scale, the weight ranges from (1-5), where (very important = 5, important = 4, medium = 3, slight = 2, rare = 1)
A: Total number of the research sample.
N: It is equal to (X) for adopting the five-point Likert scale**.**
The RII- Level was categorized as shown in **Table 2** below:

Table 2. Relative Importance Index Level **(Akadiri, 2011; Boakye and Adanu, 2022)**.

Range	The importance levels
0.8≤RI<1	High (H)
0.6≤RI<0.8	High-Medium (H-M)
0.4≤RI<0.6	Medium (M)
0.2≤RI<0.4	Medium-Low
0≤RI<0.2	Low (L)

Table 3. Factors affecting project performance.

Question 1: To what extent do the following factors affect project performance?											
Factors	**Evaluation**					**Mean**	**RII**	**RII-Level**	**Kurtosis**	**Kurtosis Classification**	**Skewness**
	very important	**Important**	**Medial**	**Little**	**Scarcely**						
Project Manager											
Incompetence	40	9	0	0	0	4.81	0.96	**H**	0.87	Lepto kurtic	-1.68
Poor site management and supervision	28	18	2	0	1	4.48	0.9	**H**	7.99	Lepto kurtic	-2.29
Slow decision-making	25	19	4	1	0	4.39	0.88	**H**	1.14	Lepto kurtic	-1.13
Senior Management											
Financing and Payments for Completed Work	39	10	0	0	0	4.79	0.96	**H**	0.72	Lepto kurtic	-1.26
Senior Management Support	33	14	2	0	0	4.63	0.93	**H**	0.26	Meso kurtic	-1.49
Inflation and Price Fluctuations	20	16	12	1	0	4.12	0.82	**H**	2.94	Lepto kurtic	-1.07
A Hostile Social and Economic Environment	6	30	11	1	1	3.79	0.76	**H-M**	0.44	Meso kurtic	-0.57
Government Policy	13	16	17	1	2	3.74	0.75	**H-M**	-0.96	Platy kurtic	-0.45
Planning											
Unstable/Inadequate/Poor Planning	26	18	3	1	1	4.37	0.87	**H**	4.52	Lepto kurtic	-1.86

Non-Compliance with Contract Terms	22	18	5	3	1	4.16	0.83	**H**	3.78	Lepto kurtic	-1.37
Changes in Designs and Bills of Quantities	13	29	5	1	1	4.06	0.81	**H**	1.45	Lepto kurtic	-1.30
Site											
Availability of skilled labor on-site	37	7	5	0	0	4.65	0.93	**H**	0.17	Meso kurtic	-0.94
Construction technology and method	26	18	4	0	1	4.39	0.88	**H**	0.89	Lepto kurtic	-0.95
Coordination and communication between project parties	19	25	5	0	0	4.29	0.86	**H**	5.10	Lepto kurtic	-1.84
Preparation of machinery on-site	21	23	3	1	1	4.27	0.85	**H**	-0.92	Platy kurtic	-0.22
Construction errors and omissions	23	17	7	2	0	4.25	0.85	**H**	-0.56	Platy kurtic	-0.23
Factors related to construction materials	16	24	9	0	0	4.15	0.83	**H**	1.13	Lepto kurtic	-1.09
Human resource experience and training	16	24	8	0	1	4.1	0.82	**H**	-0.61	Platy kurtic	-0.37
Speed of execution leading to overtime	12	25	7	4	1	3.87	0.77	**H-M**	1.56	Lepto kurtic	-1.70
Unforeseen weather and ground conditions	10	21	14	4	0	3.75	0.75	**H-M**	-0.12	Meso kurtic	-0.43
Expenses (defective work, unsuitable materials, and reconstruction)	14	23	7	3	2	3.89	0.78	**H-M**	2.71	Lepto kurtic	-1.13
Worker strikes and disputes	11	15	17	4	2	3.6	0.72	**H-M**	4.35	Lepto kurtic	-1.69
Monitoring and Evaluation											
M&E Budget Issues	14	27	7	1	0	4.11	0.82	**H**	0.36	Meso kurtic	-0.53
M&E Planning	14	26	9	0	0	4.11	0.82	**H**	-0.79	Platy kurtic	-0.16
Developing Monitoring and Evaluation Guidelines	11	26	11	1	0	3.96	0.79	**H-M**	-0.21	Meso kurtic	-0.26
Stakeholder Participation in Monitoring and Evaluation	8	24	16	1	0	3.79	0.76	**H-M**	-0.46	Platy kurtic	0.05
Using Monitoring and Evaluation Results	10	22	15	2	0	3.8	0.76	**H-M**	-0.52	Platy kurtic	-0.10
Monitoring, Feedback, and Coordination	13	21	14	1	0	3.94	0.79	**H-M**	-0.83	Platy kurtic	-0.14

By calculating the Relative Importance Index (RII) and the Relative Importance Index level (RII- Level), the factors that fall under the category of project manager and planning have all received a high ranking in the scale of relative importance. This is consistent with a study

conducted by **(Gudienė et al., 2014)**, which showed that project manager experience and project planning are critical factors in assessing project success. Another study **(Alkaabi and Mahjoob, 2022)** also showed that incomplete design work affects project performance, and the researcher believes that the competence and experience of the manager is important in addressing issues during the work wisely, and as for the factors that fall under planning, they are necessary as any work to be done correctly must be planned well in advance, so it can be said that the integration between prior planning of all project elements (before implementation) and the correct management of the project manager (during implementation), leads to a project that is completed within the set goals. This does not mean that the other factors in the other categories (senior management, location) are not important. There are factors that appeared in high proportions in the other categories. This is consistent with a study conducted by **(Del Pico, 2023)**, which showed that senior management affects time performance, and another study conducted by **(Mohammed and Jasim, 2017)**, which found that unskilled labor and equipment breakdowns are among the reasons that affect incompleteness and cause project delays.

As for the last category (monitoring and evaluation), most of its factors appeared in the (M-H) level, this reflects a natural perception of the monitoring and evaluation process in developing countries, where the researcher believes that the lack of a clear plan for monitoring and evaluation, and the reliance on simple and quick field visits to the site by supervisors and monitors, where some engineers are tasked with supervising or monitoring several projects at the same time, which weakens the monitoring and evaluation process. The researcher also believes that feedback from similar projects is not being utilized properly, which is consistent with a study conducted by **(Naji, 2014)**, which showed that one of the most significant problems facing project management is the lack of a method for documenting work that addresses performance standards for construction projects, which causes weakness in any system available for monitoring and following up on these standards, in addition to the failure to benefit from the experience gained from previous projects, which confirms the weakness of feedback. Therefore, the researcher believes it is important to promote the use of feedback to help monitor and evaluate projects and raise awareness of the importance of periodically monitoring and evaluating the site. Other categories (senior management, site) are also relatively important, as there are factors that appeared with high percentages in these categories.

To determine the extent of variation in the responses obtained from respondents, and to determine the extent of skewness in the distribution of this data, the skewness and kurtosis coefficients for the factors mentioned in the questionnaire were calculated. The results of the statistical analysis, shown in **Table 3**, describe the skewness and kurtosis results, indicating that 14 factors showed Leptokurtic in distribution, reflecting the proximity of the values to the mean. And therefore, there is a high degree of harmony and agreement among respondents regarding these factors . As for the factors that were Platykurtic distributed, there were eight factors, which showed a variation in the participants' answers, and this is attributed to the different views of the sample in answering these factors. Meanwhile, the other six factors appeared with an almost Meso-kurtic distribution, meaning that there were balanced opinions about these factors .

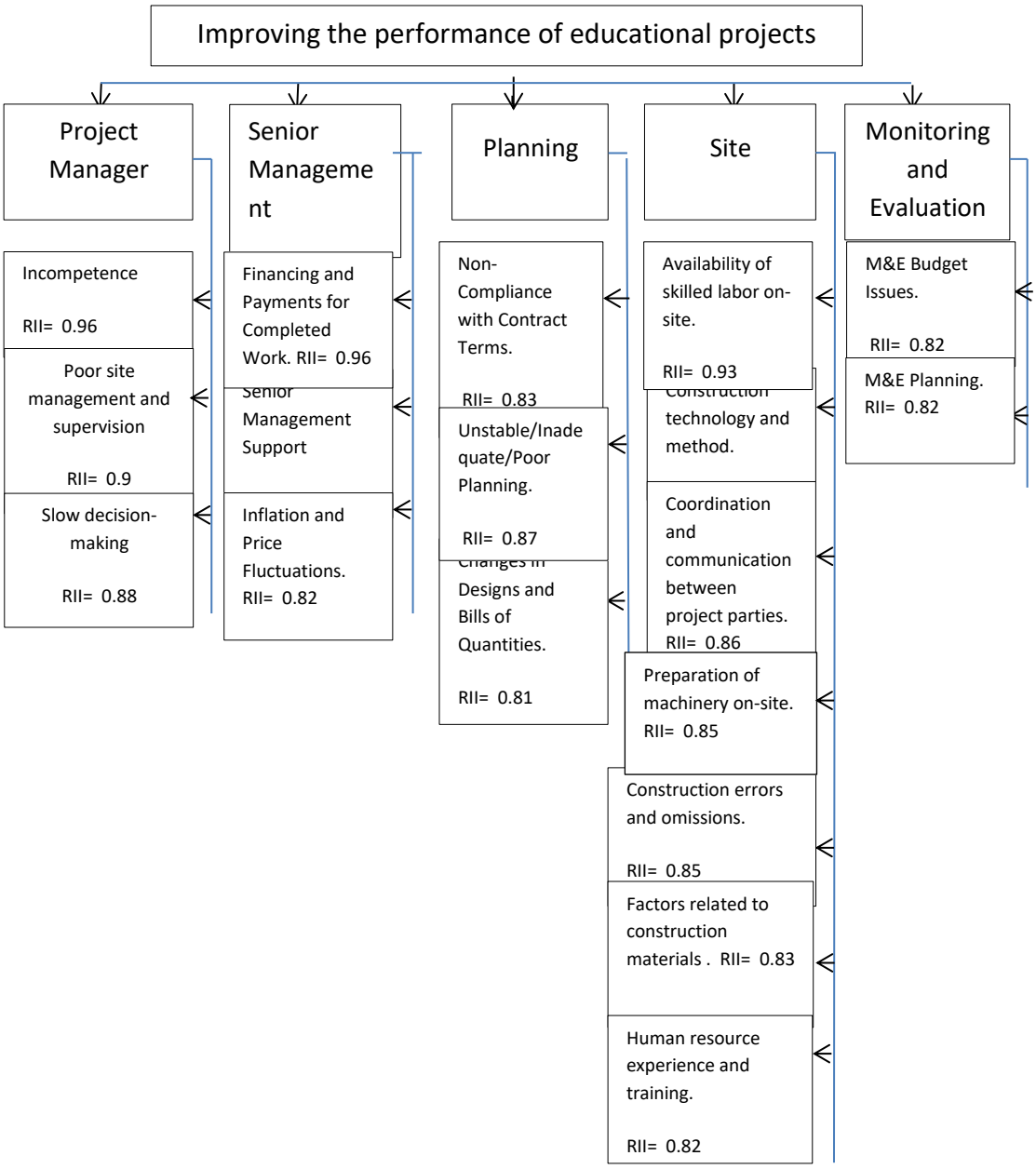

Figure 3. A structural framework for improving the performance of educational projects

The researcher noted that the factors related to the project manager and planning, which had a high level of relative importance, exhibited a leptokurtic kurtosis coefficient, which reinforces the reliability of the results of the relative importance of these factors, as it shows the extent to which the sample agreed on the importance of these factors .

As for the skewness coefficient calculated for the factors mentioned in the questionnaire, the results showed (negative values) skewed to the left, meaning that the research sample gave high estimates. This indicates the sample's agreement with the factors mentioned in this study. The skewness results also confirm the results obtained from the relative importance index, as the high skewness results show the sample's understanding of the factors studied, thus confirming the reliability of the results.

Finally, the researcher constructed a simplified structural framework to improve the performance of educational projects, based on the results obtained from **Table 3**. The framework includes three levels. The first level clarifies the objective, which is to improve the performance of educational projects. The second level includes the main categories that contain a set of factors affecting performance, and the third level includes the factors that received a high relative importance index. The researcher hopes that decision-makers will benefit from the framework shown in **Fig. 3** by focusing on the most influential factors identified in the framework for the purpose of improving the performance of educational projects.

5. CONCLUSIONS

The aim of the study was to show the impact of a set of factors within five categories (project manager, senior management, location, planning, monitoring, and evaluation) on the performance of educational projects. After reviewing previous studies, a questionnaire was prepared and distributed to a group of specialized engineers. After analyzing the results obtained from 49 participants, it was found that the most important factors affecting performance fall within the project manager and planning categories, i.e., at level (H) in terms of relative importance index. The researcher considers these two categories to be important, as accurate and detailed planning reduces the problems faced by the project in its advanced stages. As for the factors related to the project manager in terms of his competence and experience, they can control the problems that may occur in the development stage. As for the other categories (senior management, location), some factors appeared at level (H). The results also showed that the monitoring and evaluation category is at the lowest level (M-H). The research results were also reinforced by finding the Kurtosis, Skewness and the (Cranach's alpha) reliability coefficient, where the results showed agreement among the participants on the importance of factors related to the project manager and planning on project performance. Finally, a structural framework was built to improve the performance of educational projects.

Credit Author Contribution

Zahraa Abdul Kadhim Jawad: Concept, methodology preparation, data analysis, discussion of results. Sawsan Rasheed Mohammed: reviewing and validation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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العوامل المؤثرة على أداء المشاريع التعليمية

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الخلاصة

تخصص الحكومات مبالغ مالية كبيرة سنوياً لإنشاء مشاريع تعليمية مثل المدارس، نظراً لأهمية قطاع التعليم في تنمية المجتمع. ومع ذلك، تعاني معظم هذه المشاريع من ضعف الأداء. يهدف هذا البحث إلى التعرف على أهم العوامل التي تؤثر على المشاريع التعليمية من أجل تحسين أدائها وجعلها بيئة مناسبة للتعليم. ومن خلال مراجعة الأدبيات السابقة تم إعداد استبيان للحصول على البيانات المطلوبة، حيث تم إعداد استبيان للحصول على البيانات المطلوبة، وقد تضمن خمس فئات رئيسية تغطي مجموعة من العوامل التي تؤثر على الأداء. وتم توزيعها على عدد من المهندسين المتخصصين، بمختلف درجاتهم العلمية ومسمياتهم الوظيفية، من العاملين في قطاع الأبنية التعليمية. وبعد الحصول على النتائج من 49 مستجيباً ومعالجتها باستخدام الإصدار 23 من برنامج SPSS-BIM، وحساب مؤشر الأهمية النسبية، تبين أن العوامل التي تندرج تحت فئتي "مدير المشروع" و "التخطيط" كانت من أكثر العوامل تأثيراً في أداء المشروع. وكانت العوامل الأكثر تأثيراً في كل فئة على النحو التالي: وبحساب مؤشر الأهمية النسبية، تبين أن العوامل التي تندرج تحت فئتي "مدير المشروع" و "التخطيط" كانت من بين العوامل الأكثر تأثيراً في أداء المشروع. وكانت العوامل الأكثر تأثيراً في كل فئة على النحو التالي: مدير المشروع عدم الكفاءة، وسوء الإدارة، وبطء اتخاذ القرار؛ الإدارة العليا: التمويل مقابل العمل المنجز، الدعم الإداري، البيئة العدائية؛ التخطيط: الضعف وعدم الاستقرار، وعدم الامتثال لشروط العقد، والتغييرات في التصميم والكميات؛ الموقع: توافر العمالة الماهرة، وأساليب البناء، والتنسيق بين الأطراف، وإعداد الآلات، وأخطاء البناء، والعوامل المتعلقة بالمواد، وخبرة الموارد البشرية وتدريبها؛ الرصد والتقييم: القضايا المتعلقة بميزانيات الرصد والتقييم والتخطيط له. وبناءً على النتائج، تم وضع إطار عمل لتحسين أداء المشاريع التعليمية.

الكلمات المفتاحية: تحسين اداء المشاريع، المشاريع التعليمية، مؤشر الاهمية النسبية (RII).