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Proposing a General Formula for Evaluating the Parametric Cost Using MLR Method

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ABSTRACT

This research takes up address the practical side by taking case studies for construction projects that include the various Iraqi governorates, as it includes conducting a field survey to identify the impact of parametric costs on construction projects and compare them with what was reached during the analysis and the extent of their validity and accuracy, as well as adopting the approach of personal interviews to know the reality of the state of construction projects. The results showed, after comparing field data and its measurement in construction projects for the sectors (public and private), the correlation between the expected and actual cost change was (97.8%), and this means that the data can be adopted in the research study of the integration of parametric costs in a predictive model for future study. Changes in the parametric costs of construction projects substantially impact their time, cost, and quality and are a major barrier to their execution, necessitating research, analysis, and the development of the most effective solutions. The study aims to identify the parametric cost accurately through iterative tests and continuous improvements by presenting literature describing the history and characteristics of the parametric cost methodologies and identifying each methodology's limitations, strengths, and weaknesses to promote a better understanding of their best practices and use for managing project cost

Keywords: Parametric cost, Research Methodology, Sample size, Data Analysis,

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اقتراح صيغة عامة لتقدير التكلفة البارا مترية باستخدام طريقة MLR

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الخلاصة

يتناول البحث الجانب العملي بأخذ دراسات لحالة المشاريع الإنشائية التي تشمل المحافظات العراقية المختلفة، اذ يتضمن إجراء مسح ميداني للتعرف على تأثير التكاليف المعيارية على مشاريع البناء ومقارنتها بما تم التوصل إليه خلال التحليل والمدى من صحتها ودقتها وكذلك اعتماد منهج المقابلات الشخصية لمعرفة واقع حالة المشاريع الإنشائية وبينت النتائج بعد المقارنة بين البيانات الحقلية وقياسها في المشاريع الانشائية للقطاعي(العام والخاص) ان قوة الارتباط بين تغيير الكلفة المتوقع و الفعلي (% 97.8) وهذا يعني أن البيانات يمكن اعتمادها في الدراسة البحثية لتكامل الكلف البارا مترية (المعيارية) في نموذج تنبؤي للدراسات المستقبلية, تؤثر التغييرات في التكاليف المعيارية لمشاريع البناء بشكل كبير على وقتها وتكلفتها وجودتها وتشكل عائقًا رئيسيًا أمام تنفيذها ، مما يستلزم البحث والتحليل وتطوير الحلول الأكثر فاعلية. يهدف البحث تحديد التكلفة المعيارية بدقة من خلال الاختبارات التكرارية والتحسينات المستمرة من خلال تقديم الأدبيات التي تصف تاريخ وخصائص منهجيات التكلفة المعيارية وتحديد حدود كل منهجية ونقاط قوتها ونقاط ضعفها لتعزيز فهم أفضل لأفضل ممارساتها واستخداماتها لإدارة تكلفة المشروع

الكلمات الرئيسية: الكلف المعيارية , حجم العينة , منهجية البحث, تحليل البيانات.

1. INTRODUCTION

Many research gaps necessitate familiarity with typical costs. The difficulty is finding the most relevant knowledge of the primary standard cost that significantly impacts the project's ultimate cost to cover all estimation components. These parameters must be quantifiable for any new guess in the conceptual costing model. It's tough to estimate costs conceptually. It happens at the start of a project when there is little information and many variables to consider. It is unknown how this may affect project costs. Conceptual cost estimating in every project planning and feasibility research can significantly impact the overall construction budget and the project's estimated cost **(Alzobaae, 2016).** The assessment of overall expenses is known as the conceptual cost prediction of a project based solely on the project's early general concepts. Defining inputs is one of the most crucial tasks in establishing a parametric cost model poorly input selective, on the other hand, may harm the suggested model's performance **(Aswed, 2015)**. As a result, expert opinions may assist decision-makers in determining the Standard cost. Most researchers turn to the literature when choosing the primary cost elements for a project. In general, if there are no cost drivers **(Baker, 2011).** Delphi Tours can help find them through interviews with specialists—unfortunately, neither strategy rules.

This work aims to develop a hybrid computer program based on a conceptual framework to facilitate the management of the construction parametric cost projects, find a bridge between integrated parametric cost programs and traditional cost project management concepts, and develop a framework for the That. There is necessary to investigate how to

overcome obstacles in costs and implementation of projects in the future to enhance construction project efficiency standards.

2. METHODOLOGY

The methodology used in this research is that parametric cost affected the project. Therefore, using multi-linear regression by data selected and analyzed and utilized comparison between actual and predicted parametric cost. The research methodology can be summarized as shown in **Fig. 1**.

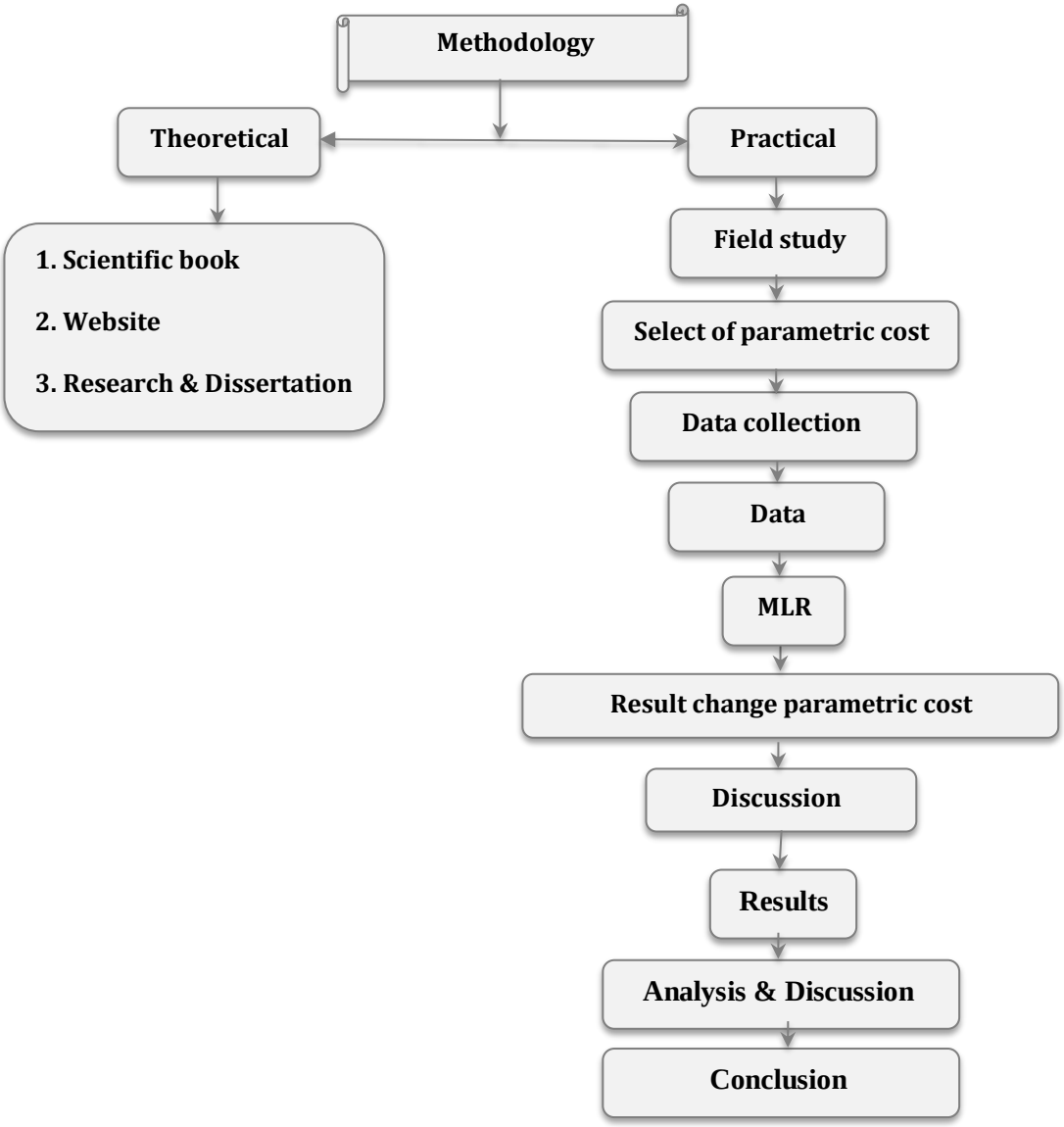

Figure 1. A diagram of the research methodology

2.1 Personal Interview with Construction Project Engineers

The personal interviews approach was adopted in this study because it helps to know the extent of the impact of the parametric costs on construction projects during the planning or implementation of the construction project **(Jumaa, 2022).** Understanding the reasons that

lead to the completion delay of the project within the schedule and budget facilitates access to the affected parameters on project completion **(Hassan, 2019)**. The questionnaire was distributed to engineers in engineering projects working in the public and private sectors, and many questions related to construction projects were asked. There is a statistical significance (**H0, H1**) in using these integrated models and knowing the sensitivity of the parametric cost affecting the construction projects, conducting many personal interviews with engineers working on construction projects in the public and private sectors, whose experience exceeds [25-more than 30 years] **(Yockey, 2018)** the questions and answers within the personal interviews are shown in **Table 1**.

2.2 Sample Size and Selection Method

The questionnaire process included a sample of engineers in construction projects in the public and private sectors. The questionnaire was distributed to (100) construction projects for the various governorates of Iraq, as the competent authorities filled them out **(Landau et al., 2004).** The questionnaire included (17) basic specialized questions for the experienced category (15-35) based on the answer to one of the options listed in the questions with only one reference so that the answer is specific to the required questions. **(Kim, 2013).**

Table.1 The questions and answers within the personal interviews

No	Questions	Answers
1	Does the year of construction affect the implementation of the construction project?	Yes, it affects, As longer years of project completion, greater risk of the materials due to exchange rate, the security stability in the construction project area, poor assessment of some project activities that lead to delay and reluctance
2	What is the effect of contingencies in a construction project?	contingencies are of great importance in construction projects, especially in the case of high costs of construction materials, as well as instability of exchange, but it is challenging to obtain them because they are linked to very complex procedures, and there is a very small percentage to accept them because of the routine in the ministries, departments and concerned authorities
3	What is the effect of the Inflation rate on a construction project?	Many reasons affect construction projects, including pricing in foreign currency without pricing in the national currency, which negatively affects the event of its instability due to the high tendency to spend and the weak tendency to save construction projects without government support the mentioned reasons.
4	What is the effect of changes in standards or specifications rate in a construction project?	It is one of the most important reasons that affect the construction projects, but it has a significant impact on the implementation of projects, as it acts as the master schedule; as it leads to the delay and interruption of the sequence activities of the project and this in turn, causes a loss to the owner of the contractor and the owner.
5	What is the impact of Equipment (Size, availability, and complexity) in a construction project?	Equipment is selected by committees specialized in equipment (equipment technicians) by defining its age, number of years of operation, and the amount of fuel exhaust emissions from it. Several mechanisms may be excluded in many construction projects because they emit a large number of gases polluting the environment in general,

		and their effect leads to delaying activities That need these mechanisms, especially in complex projects that require advanced automation
6	Is the cost data for similar work affected by the construction project?	Yes, it is very important because most residents use this method without consulting and updating the price lists. Instead, it is sufficient to multiply the price of each event with a financial safety factor that does not exceed (1-3%) and then include these events in the pricing.
7	Are the Work of circumferences affects construction projects?	Yes, it affects us **1.** The security situation **2.** Non-disbursement of financial dues to the contractor **3.** Religious occasions and roadblocks prevent materials, equipment, or personnel from reaching the work site **4.** Technical conditions that lead to work interruption, and the reason is due to the failure to conduct the necessary examinations for the work site or late checks as a result of obtaining approvals to conduct the examinations or the occurrence of a replacement matter requiring the replacement of soil or a change in a specific work method **5.** Environmental conditions that have recently been developed, namely dust storms and high temperatures above the reasonable limit, negatively affect the work level.
8	What is the effect of Consultant performance and errors in design on a construction project?	The consultant's performance and design errors affect the project's activities in terms of incorrectness and the costs of consulting fees he receives and may delay in deciding negatively affects the schedule of the project's activities as well as the quality of the project.
9	What is the effect of a change order on a construction project?	It has a very significant impact on the construction project and depends on the type of contract. In many types of contracts, that cannot be approved or worked, and the paragraph can be completed or canceled just because the type of contract cannot make a Change order. This affects the cost of the project in addition to its time and, sometimes, several times its quality. There is another possibility that can be approved, but still, the pricing is not commensurate with the paragraph size to be worked on. Ultimately, standby requests in construction projects are complex to be recognized and implemented because they require a challenging routine between the departments and stakeholders.
10	What's Indemnity and insurance certain circumstances obliges client and contractor ?	The contractor must assume certain types of insurance coverage at its expense. , because they own vast assets, will accept coverage of major risks either by self-insurance or by worldwide brokerage However, the contractor will be required to insure against (for) protection and indemnity, general third-party liability, personnel, and, in some cases, automobile liability. The contractor must produce proof of these covers before work is allowed to start. The following text is a complete list of covers used in the industry, although not all of these would be required in any project. In certain circumstances where the risks are great, the client may go further and indemnify and hold the contractor harmless from all claims by the client for damage as follows. **1.** Any damage, as mentioned in the preceding text, after final acceptance to the extent that the contractor's insurance does not cover such claims.

		2. Any damage to third-party life and property is no to covered by the contractor's insurance **3.** Any damage arising from using vehicles supplied by the client to the contractor for use in the work. **4.** Any damage caused by pollution **5.** Any damage to or loss of client-supplied materials during transport by the contractor
11	Is the size of the project affect a construction project?	Yes, the larger project, the greater requirements, complexities, and cost, as well as the methods of its implementation. What also increases orders for consultants, a professional team, and professionally priced bills of quantities, far from error and uncertainty, and determining the type of contract suitable for work. In most cases, contracts of high nature and quality are resorted to, which is costly but essential to avoid the above errors.
12	Is escalation any need in the construction project?	We need this parameter because it solves many problems, and you kindly asked us about them before and after
13	What is the scope of work affected by the construction project?	It is very important to determine the costs and the extent of the need for expertise and automation required for each work activity.
14	Which type of contract is suitable for a construction project?	In simple projects, it is possible to use contracts with a simple possibility, such as direct execution and short-form contract contracts, but we have resorted to design-belt and turnkey contracts, which may be expensive and indicate the type and volume of work to be done. Each type of contract impacts the project in terms of required quality, time, and cost.
15	What are the constraint (policy and security) that affects a construction project?	Economic, technology, environmental, legal, political, and all of them affect the project costs from the start of the project until its completion and delivery
16	Is the labor (Type of test) affected by the construction project?	The most important thing that suffers is the rare checks requiring consultants with experience and behind the project, and the reason for these high costs is the lack of a good technical feasibility study of the project, which leads to the emergence of this type of problem.
17	Is Procurement (import or export) affect construction projects?	The supply is very effective, whether from inside or outside, due to the technical and environmental restrictions imposed on some projects, especially road and bridge projects. From the imported parts, the corrugated iron and the pre-stressed iron that is imported from abroad in the way that reaches the work site and costs a long time that is not calculated and included within the activities, as well as delay costs and transport costs that are not well estimated. From the inside, we face the problem of transportation and the method of supply since most of what is required is far from the work site or there are young or political restrictions in importing it.

Each expert offers a view as ever **(Ranasinghe, 2000).** The grasp equation is then used to collect all of the opinions for each parameter and classify them. P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}, P_{15}, $P_{16,}$ and P_{17} are the remaining 17 parameters from the original 78 **(Enshari, 2009). Table 2** shows the important parameters selected by Delphi **(Keziah, 2021),** FDM (Fuzzy Delphi Method), and FAHP (Fuzzy Analytic Hieratical Process) analysis. Then applying, these data in (100) projects using MLR to satisfy the correlation between parameters and check it.

Table 2. Important parameters

Parameters	Types
P_1	Inflation rate
P_2	Year of construction
P_3	Contingencies and Peripheral Costs
P_4	Changes in standards or specifications
P_5	Cost Data for Similar Work
P_6	Consultant performance and errors in design
P_7	Change order
P_8	Indemnity and insurance
P_9	Size of project
P_{10}	Escalation if any
P_{11}	Scope of work
P_{12}	Type of contract
P_{13}	Constraint (policy and security
P_{14}	Work of circumferences
P_{15}	Equipment (size, availability, and complexity)
P_{16}	Labor (Type of test)
P_{17}	Procurement(import or export)

3. RESULTS AND DISCUSSION

Regression analysis is an extremely powerful tool that enables the researcher to know more about the relationships within the studied data. In this instance, **(Gunduz, 2020)** MLR helps one understand the typical constant 78 parameters. There is a statistical significance (H_0, H_1) in using MLR for knowing the sensitivity of the parametric cost affecting construction projects **(Ismaeel, 2021).** In statistics, linear regression is an approach for modeling the relationship between a scalar dependent variable y and one or more explanatory variables (or independent variables) denoted (V). The case of one explanatory variable is called simple linear regression. For more than one explanatory variable, the process is called MLR **(Koriala, 2021).**

Moreover, MLR can be used to define the statistical relationship between a response variable change costs ($\mathbf{c._c}$). **Table 3** illustrates data measurement of parameters that affect 100 projects change depended on, and the explanatory variables (e.g., inflation rate, contingency, etc.)The regression analysis model requires a few assumptions. It is of the following form.

$$\mathbf{c._c = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + \ldots\ldots\ldots\ldots + \beta_p x_{ip} + \mathscr{f}_i} \quad (1)$$

where:

$\mathbf{c._c}$ is the response that corresponds to the levels of the inputs of explanatory variables x_1, x_2, x_3 ..., x_p at the i^{th} observation, as shown in **Table 2.**

β_0, β_1, ….,β_p are the coefficients in the linear relationship for a single factor (p = 1), β_0 is the intercept, and β_1 is the slope of the straight line defined **(Mishra, 2021).**

$\mathscr{f}_1, \mathscr{f}_2, \ldots\ldots, \mathscr{f}_n$ **(Al Maamari, 2021)**are errors that create scatter around the linear relationship at each i =1 to (n) observations. This constant variance assumption must hold, but this is sometimes difficult to achieve **(Tuloli, 2021). Table 4** checks the correlation between

parameters and had been calculated from the measurement, and **Fig. 2** illustrates regression between changes in cost
where

$$c_c = 1.186 + 0.122P_1+0.061P_2-0.089P_3+.0155P_4+0.211P_5-0.001P_6-0.2574P_7+.018P_8+ 0.00P_9+0.291P_{10}+0.293P_{11}-0.225P_{12}-0.071P_{13}-0.161P_{14}-0.387P_{15}-0.094P_{16}+0.41P_{17}$$

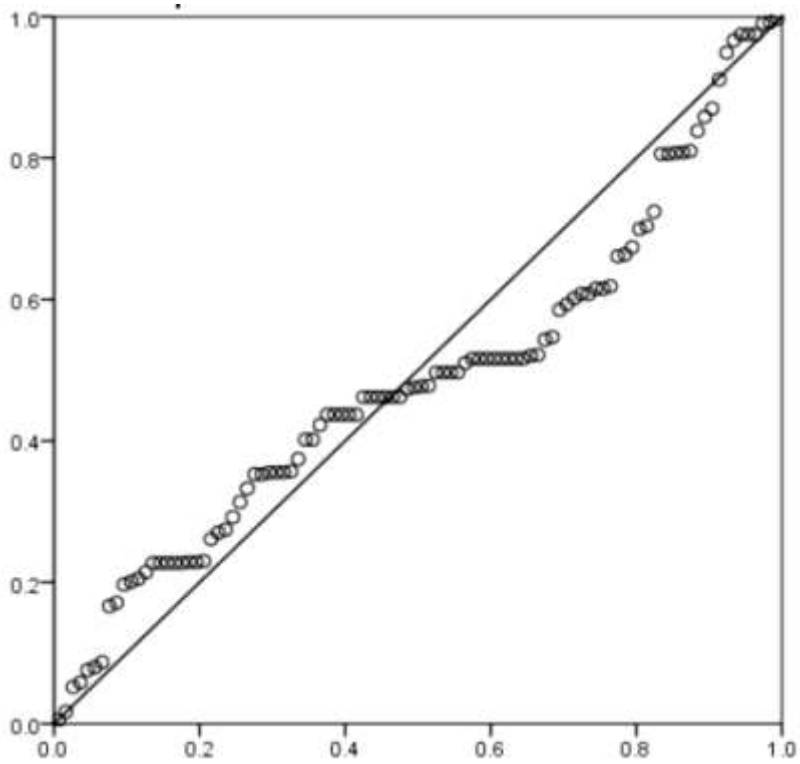

Figure 2. Regression between changes in cost

Table 3. Data measurement of parameters affected on 100 projects

p → / No of pro ↓	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	P_{11}	P_{12}	P_{13}	P_{14}	P_{15}	P_{16}	P_{17}	C.c
1	2	1	2	2	2	3	2	1	0.4	2	1	16	1	2	2	5	3	1.114
2	1	2	3	3	2	3	2	2	0.5	2	1	22	2	3	1	4	2	1.6
3	2	3	1	1	3	2	2	3	1.6	2	1	15	3	1	2	3	1	3.128
4	1	2	3	2	3	3	2	1	2	2	1	16	1	3	1	2	3	1.134
5	2	1	2	3	3	3	2	2	1	2	1	22	2	2	1	2	2	1.295
6	3	2	2	2	2	3	2	3	3	1	1	23	3	2	3	1	2	1.998
7	2	3	3	1	2	3	2	2	2	2	1	19	1	1	2	2	2	1.57

8	1	2	2	2	2	3	3	1	5	1	2	18	2	2	2	3	2	1.68
9	2	1	1	3	1	3	2	2	2	2	1	17	3	3	3	1	2	1.89
10	4	2	2	2	1	3	1	3	1	2	2	16	3	2	2	1.7	1	1.54
11	2	3	3	1	1	2	2	2	11	1	2	22	2	1	1	1.6	1	1.867
12	1	2	2	2	1	1	3	1	12	2	1	26	1	2	2	1	1	2.015
13	2	1	1	3	1	2	2	2	28	2	2	25	2	2	2	1.9	3	1.7
14	3	2	2	2	1	2	1	3	25	2	1	24	3	3	1	2.3	3	2.55
15	2	3	3	1	1	1	2	2	6	2	2	23	2	2	2	1	3	2.425
16	1	2	2	2	1	2	3	1	2	1	1	23	2	1	2	4	1	1.99
17	2	1	1	3	1	1	2	2	1	1	2	25	3	2	2	2	2	1.99
18	3	2	2	2	1	2	1	3	2	2	1	24	1	3	3	3	3	2.014
19	2	3	3	1	1	2	2	2	6	1	2	26	2	2	3	2	1	1.691
20	1	2	2	2	1	3	3	1	0.7	2	1	28	3	1	3	1	2	1.8
21	2	1	1	3	1	2	2	2	0.4	2	2	21	1	2	2	2	3	1.598
22	3	2	2	2	1	1	1	3	0.8	1	1	23	2	3	1	3	1	2.387
23	2	3	3	1	3	2	2	2	0.9	2	3	25	3	2	2	2	2	1.989
24	1	2	2	2	3	3	3	1	0.6	1	3	26	1	3	3	1	3	1.185
25	3	1	1	3	3	2	2	2	0.55	2	3	19	3	2	3	2	3	1.296
26	3	2	2	2	2	2	1	3	2	3	3	30	2	1	2	5	2	1.41
27	3	3	3	1	1	3	2	2	10	2	2	22	1	2	2	2	3	1.625
28	3	2	2	2	2	3	3	1	11	1	3	31	2	3	2	2	2	1.355
29	3	1	1	3	3	2	3	2	12	2	3	22	3	2	3	4	3	1.744
30	3	2	2	2	2	1	2	1	2	2	1	24	2	1	1	4	2	1.97
31	2	3	3	1	1	3	1	2	5	1	1	25	1	2	2	2	3	1.78
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33	2	1	1	3	3	1	3	1	16	2	1	25	3	3	2	2	1	2.2
34	1	2	2	2	2	2	2	2	35	1	2	6	2	2	1	2	2	1.99
35	3	3	3	3	3	3	3	3	31	3	3	24	3	3	3	3	3	2.22
36	3	2	2	2	2	1	2	1	2	2	1	24	2	1	1	4	2	1.87
37	2	3	3	1	1	3	1	2	5	1	1	25	1	2	2	2	3	1.78

38	3	2	2	2	2	2	2	3	8	3	1	25	2	2	3	3	2	2.31
39	2	1	1	3	3	1	3	1	16	2	1	25	3	3	2	2	1	2.2
40	1	2	2	2	2	2	2	2	35	1	2	6	2	2	1	2	2	1.99
41	3	3	3	3	3	3	3	3	31	3	3	24	3	3	3	3	3	2
42	3	2	2	2	2	2	2	3	8	3	1	25	2	2	3	3	2	2.1
43	2	1	1	3	3	1	3	1	16	2	1	25	3	3	2	2	1	2.2
44	1	2	2	2	2	2	2	2	35	1	2	6	2	2	1	2	2	1.9
45	3	3	3	3	3	3	3	3	31	3	3	24	3	3	3	3	3	2
46	3	2	2	2	2	1	2	1	2	2	1	24	2	1	1	4	2	1.87
47	2	3	3	1	1	3	1	2	5	1	1	25	1	2	2	2	3	1.488
48	3	2	2	2	2	2	2	3	8	3	1	25	2	2	3	3	2	2.19
49	2	1	1	3	3	1	3	1	16	2	1	25	3	3	2	2	1	2.2
50	1	2	2	2	2	2	2	2	35	1	2	6	2	2	1	2	2	1.9
51	3	3	3	3	3	3	3	3	31	3	3	24	3	3	3	3	3	2
52	2	1	1	3	1	3	2	2	2	2	1	17	3	3	3	1	2	1.9
53	4	2	2	2	1	3	1	3	1	2	2	16	3	2	2	1.7	1	1.4
54	2	3	3	1	1	2	2	2	11	1	2	22	2	1	1	1.6	1	1.7
55	1	2	2	2	1	1	3	1	12	2	1	26	1	2	2	1	1	2.025
56	2	1	1	3	1	2	2	2	28	2	2	25	2	2	2	1.9	3	1.7
57	3	2	2	2	1	2	1	3	25	2	1	24	3	3	1	2.3	3	2.551
58	2	3	3	1	1	1	2	2	6	2	2	23	2	2	2	1	3	2.125
59	1	2	2	2	1	2	3	1	2	1	1	23	2	1	2	4	1	1.8984
60	2	1	1	3	1	1	2	2	1	1	2	25	3	2	2	2	2	2.1
61	3	2	2	2	1	2	1	3	2	2	1	24	1	3	3	3	3	2.0017
62	2	3	3	1	1	2	2	2	6	1	2	26	2	2	3	2	1	1.671
63	1	2	2	2	1	3	3	1	0.7	2	1	28	3	1	3	1	2	1.8
64	2	1	1	3	1	2	2	2	0.4	2	2	21	1	2	2	2	3	1.489
65	3	2	2	2	1	1	1	3	0.8	1	1	23	2	3	1	3	1	2.298
66	2	3	3	1	3	2	2	2	0.9	2	3	25	3	2	2	2	2	1.698

67	1	2	2	2	3	3	3	1	0.6	1	3	26	1	3	3	1	3	1.185
68	3	1	1	3	3	2	2	2	0.55	2	3	19	3	2	3	2	3	1.286
69	3	2	2	2	2	2	1	3	2	3	3	30	2	1	2	5	2	1.388
70	3	3	3	1	1	3	2	2	10	2	2	22	1	2	2	2	3	1.385
71	3	2	2	2	2	3	3	1	11	1	3	31	2	3	2	2	2	1.135
72	3	1	1	3	3	2	3	2	12	2	3	22	3	2	3	4	3	1.744
73	3	2	2	2	2	1	2	1	2	2	1	24	2	1	1	4	2	1.787
74	2	3	3	1	1	3	1	2	5	1	1	25	1	2	2	2	3	1.538
75	3	2	2	2	2	2	2	3	8	3	1	25	2	2	3	3	2	2.1
76	2	1	1	3	3	1	3	1	16	2	1	25	3	3	2	2	1	2.2
77	1	2	2	2	2	2	2	2	35	1	2	6	2	2	1	2	2	1.79
78	3	3	3	3	3	3	3	3	31	3	3	24	3	3	3	3	3	2
79	3	2	2	2	2	1	2	1	2	2	1	24	2	1	1	4	2	1.87
80	2	3	3	1	1	3	1	2	5	1	1	25	1	2	2	2	3	1.38
81	3	2	2	2	2	2	2	3	8	3	1	25	2	2	3	3	2	2.1
82	2	1	1	3	3	1	3	1	16	2	1	25	3	3	2	2	1	2.2
83	1	2	2	2	2	2	2	2	35	1	2	6	2	2	1	2	2	1.9
84	3	3	3	3	3	3	3	3	31	3	3	24	3	3	3	3	3	2
85	3	2	2	2	2	2	2	3	8	3	1	25	2	2	3	3	2	2.1
86	2	1	1	3	3	1	3	1	16	2	1	25	3	3	2	2	1	2.2
87	1	2	2	2	2	2	2	2	35	1	2	6	2	2	1	2	2	1.9
88	3	3	3	3	3	3	3	3	31	3	3	24	3	3	3	3	3	2
89	3	2	2	2	2	1	2	1	2	2	1	24	2	1	1	4	2	1.87
90	2	3	3	1	1	3	1	2	5	1	1	25	1	2	2	2	3	1.78
91	3	2	2	2	2	2	2	3	8	3	1	25	2	2	3	3	2	2.1
92	2	1	1	3	3	1	3	1	16	2	1	25	3	3	2	2	1	2.2
93	1	2	2	2	2	2	2	2	35	1	2	6	2	2	1	2	2	1.9
94	3	3	3	3	3	3	3	3	31	3	3	24	3	3	3	3	3	2.018
95	2	1	2	2	2	3	2	1	0.4	2	1	16	1	2	2	5	3	1.4
96	1	2	3	3	2	3	2	2	0.5	2	1	22	2	3	1	4	2	1.6

97	2	3	1	1	3	2	2	3	1.6	2	1	15	3	1	2	3	1	3.177
98	1	2	3	2	3	3	2	1	2	2	1	16	1	3	1	2	3	1.204
99	2	1	2	3	3	3	2	2	1	2	1	22	2	2	1	2	2	1.195
100	2	2	2	2	2	2	3	3	2	3	2	25	3	3	3	3	3	2.784

4. CONCLUSION

The current study demonstrates how the MLR technique depends on accuracy percentage values (AA%, R%, R^2, MPE%, RMSE%, MPE%, and SIG). It shows accurate data selected from the field, real questions and answers within personal interviews, and the significance of the MLR technique, which is more accurate and practical in checking changing parameters. The correlation between $C._C$ prediction and $C._C$ actual is 97.8%, suggesting that the data should also be dependent. Changes in the parametric costs of construction projects substantially impact their time, cost, and quality. They are a major barrier to their execution, necessitating research, analysis, and development of the most effective solutions.

Table 4. The correlation between parameters

No of pro	*R*	*R^2*	*MAPE*	*RMSE*	*MPE*	*AA%*	*SIG*	*$C._C$ actual*	*$C._C$ Estimate*	*Error*
1								1.114	1.149	-0.035
2								1.6	1.662	-0.062
3								3.128	3.155	-0.027
4								1.134	1.256	-0.122
5								1.295	1.197	0.098
6								1.998	1.989	0.009
7								1.57	1.571	-0.001
8								1.68	1.636	0.044
9								1.89	1.858	0.032
10								1.54	1.450	0.0893
11								1.867	1.742	0.1244
12								2.015	1.969	0.046
13								1.7	1.717	0.0179
14								2.55	2.543	0.0067
15								2.425	2.258	0.167
16								1.99	1.968	0.022
17								1.99	2.02	-0.03
18								2.014	1.986	0.028
19								1.691	1.74	-0.049
20								1.8	1.817	-0.017
21								1.598	1.517	0.081
22								2.387	2.339	0.048
23								1.989	1.782	0.207
24								1.185	1.155	0.03
25								1.296	1.359	-0.063
26								1.41	1.403	0.007
27								1.625	1.565	0.06
28								1.355	1.272	0.083
29	**0.979**	**0.958**	**13.7%**	**0.0802**	**0.137**	**86.3%**	**0.187**	1.744	1.771	-0.027

30								1.97	1.869	0.101
31								1.78	1.602	0.178
32								2.19	2.159	0.031
33								2.2	2.188	0.012
34								1.99	1.899	0.091
35								2.22	1.993	0.227
36								1.87	1.869	0.001
37								1.78	1.602	0.178
38								2.31	2.159	0.151
39								2.2	2.188	0.012
40								1.99	1.899	0.091
41								2	1.993	0.007
42								2.1	2.159	-0.059
43								2.2	2.188	0.012
44								1.9	1.899	0.001
45								2	1.993	0.007
46								1.87	1.869	0.001
47								1.488	1.602	-0.114
48								2.19	2.159	0.031
49								2.2	2.188	0.012
50								1.9	1.899	0.001
51								2	1.993	0.007
52								1.9	1.858	0.042
53								1.4	1.450	0.0507
54								1.7	1.742	0.0426
55								2.025	1.969	0.056
56								1.7	1.717	0.0179
57								2.551	2.543	0.0077
58								2.125	2.258	-0.133
59								1.8984	1.968	0.0696
60								2.1	2.02	0.08
61								2.0017	1.986	0.0157
62								1.671	1.74	-0.069
63								1.8	1.817	-0.017
64								1.489	1.517	-0.028
65								2.298	2.339	-0.041
66								1.698	1.782	-0.084
67								1.185	1.155	0.03
68								1.286	1.359	-0.073
69								1.388	1.403	-0.015
70								1.385	1.565	-0.18
71								1.135	1.272	-0.137
72								1.744	1.771	-0.027
73								1.787	1.869	-0.082
74								1.538	1.602	-0.064
75								2.1	2.159	-0.059
76								2.2	2.188	0.012
77								1.79	1.899	-0.109
78								2	1.993	0.007
79								1.87	1.869	0.001
80								1.38	1.602	-0.222
81								2.1	2.159	-0.059
82								2.2	2.188	0.012
83								1.9	1.899	0.001
84								2	1.993	0.007

85								2.1	2.159	-0.059
86								2.2	2.188	0.012
87								1.9	1.899	0.001
88								2	1.993	0.007
89								1.87	1.869	0.001
90								1.78	1.602	0.178
91								2.1	2.159	-0.059
92								2.2	2.188	0.012
93								1.9	1.899	0.001
94								2.018	1.993	0.025
95								1.4	1.149	0.251
96								1.6	1.662	-0.062
97								3.177	3.155	0.022
98								1.204	1.256	-0.052
99								1.195	1.197	-0.002
100								2.784	2.777	0.007
Correlation between $C._{C\ predict}$ and $C._{C\ actual}$ **97.8**										

where : **AA** : Average Accuracy ; **R**: Coefficient of Correlation ; **R^2**: Coefficient of Determination
MAPE: Mean Absolute Percentage Error ; **RMSE**: Rote Mean Square Error ; **MPE**: Mean Percentage Error
SIG: Significant

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