Research Article

Arshed Abbas Mohammed* and Kadhim Raheim Erzaij

# Utilization of serial tendering to reduce the value project

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**Abstract:** Serial tendering is better than other types of tendering when it comes to cost reduction, where civil infrastructure projects need a significant increase in the amount of tough planning, financial expenditures, engineering work, and resources of a different character than other types of construction projects. The effects of a lack of funding cause decrease in the completion speed of the project on time. The need to reduce the cost of bidding on recurrent civil infrastructure projects is critical. To achieve the desired goals of this research, this article will provide an overview of the type of bids used in the construction of schools implemented in the current financial perspective in Iraq, the extent of benefit, and the amount of possible reduction if continuous and serial tendering are used.

**Keywords:** continuity tendering, serial tendering, repetitive projects, construction management

## 1 Introduction

In huge construction projects like housing developments, schools, and hospitals, the owner must sustain a continuing building program. Participants in such bids are expected to sign a series of contracts with the same terms and conditions. When all bids are allowed to compete [1], the owner and contractor may plan their work more confidently in advance in planning repetitive projects [2,3]. Contractors are more likely to guide if future projects are involved, and they will have more time to organize their resources and build experience. Because the contractor has more time to prepare, future projects will be more efficient [4].

Information of ten awarded and implemented schools were collected using the open tendering method, within the city of Baghdad and for the same funding allocated for the year of the contracting shown in Table 1. The beneficiary entity, the Ministry of Education, – the school buildings, the implementing agency, the Baghdad Governorate/ the Engineering Department, the School Buildings Division – was selected through an open tendering competition and awarded to the private sector companies.

An analysis of the tables of assigned quantities was carried out using the standard manual and open interviews with the contractors implementing the schools and the resident engineer department in the school buildings division, the contracts department, and all the parties related to the project (stakeholders); the sample was taken for ten schools.

An analysis of the project's activities was also conducted if continuous and open tenders were used instead of open tenders using the unified standard guide of the Ministry of Planning to analyze work activities and the required quantities of materials, labor and financing through open interviews with implementing contractors, banks and all parties involved in the implementation of the work and taking the highest possible reduction by taking advantage of the factors that were identified in this interviews.

## 2 Backgrounds about serial tendering

Serial tendering, according to the experts, is those in which bids are submitted in accordance with a specified timetable or amount of business [5]. This method enables tenderers to assess the performance of comparable projects over a certain period. Small enterprises, consistent revenue, and contracts for routine maintenance are all examples [6]. Tender documents typically include the

* **Corresponding author: Arshed Abbas Mohammed,** Civil Engineering Department, Project Management Branch, University of Baghdad College of Engineering, Baghdad, Iraq, e-mail: a.mohammed1901m@coeng.uobaghdad.edu.iq
**Kadhim Raheim Erzaij:** Civil Engineering Department, Project Management Branch, University of Baghdad College of Engineering, Baghdad, Iraq, e-mail: kadhim69@coeng.uobaghdad.edu.iq

**Table 1:** The cost of bids awarded by the open tendering (case study)

| No. | Tendering number by government | Total cost in a million IQ |
|---|---|---|
| 1 | Tendering No. (61) | 1184.166 |
| 2 | Tendering No. (71) | 1184.168 |
| 3 | Tendering No. (4) | 1209.613 |
| 4 | Tendering No. (58) | 1217.457 |
| 5 | Tendering No. (13) | 1255.047 |
| 6 | Tendering No. (12) | 1263.016 |
| 7 | Tendering No. (11) | 1264.066 |
| 8 | Tendering No. (66) | 1328.585 |
| 9 | Tendering No. (40) | 1328.585 |
| 10 | Tendering No. (27) | 1480.208 |

job's scope, a completion date, the cost per unit, and an estimate of the total number of orders. Tendering costs can be lowered, and as a consequence, suppliers may be more prepared to offer cheaper prices in order to secure long-term contracts [7]. Chain bidding may be justified on the grounds that it reduces competition and investment by other providers unable to get bids. However, it encourages stability and innovation by instilling confidence among successful contractors to invest [8].

Serial tendering is based on a model or presumptive bill of goods or an agenda [9]. A succession of identical projects can then utilize the pricing offered to assess the job for a certain amount of time, following which the tendering can be repeated. Repeated tendering reduces the cost of bidding and encourages suppliers who want a long-term contract to lower their bids [10].

# 3 Project activities awarded using serial tendering

Project files have been opened for the study case in the Engineering Department as shown in Table 1, the resident engineer department in Baghdad governorate, and all the information on the basis of which the project costs were built, knowing the details of the materials supplied and implemented in the project, as well as taking all financial deductions that are deducted from Accounts and Audit Department in Baghdad governorate and all pre-contracting and post-project expenses from the contracts department in Baghdad governorate, meeting with contractors executing the project, and knowing the details of administrative costs and other fees detailed in Table 2.

**Table 2:** Distribution of price value percentage on the case study of the project awarded to the open tendering

| No. | Activity | | % of the value price | |
|---|---|---|---|---|
| 1 | Designs and drawings | | 4 | |
| 2 | Supervision | | 2.50 | |
| 3 | Purchasing tender documents | | 0.02 | |
| 4 | Financial invoices | Tax's | 3.30 | 14.43 |
| | | Engineering insurance | 0.05 | |
| | | Engineering stamp | 0.05 | |
| | | Postage stamp | 0.03 | |
| | | Reserve amount (contingency) | 10 | |
| | | Banking services | 1 | |
| 5 | Administrative expenses | | 8.5 | |
| 6 | cost of supply raw material and procurement | | 35 | |
| 7 | Execution (implement) | | 25 | |
| 8 | Profits | | 10.55 | |
| Total | | | 100 | |

# 4 Analyzing project amounts and comparing them to serial tendering

Ten schools were considered awarded by the open tendering method from the governorate of Baghdad, where the tenders were commenced simultaneously and transferred in the form of ten individual tenders. Their amounts are shown in Table 1, the estimated cost of these 1,250 million Iraqi dinars (MIQ) for each tender. It turns out that the referral costs are limited to between 1,000 and 1,500 MIQ. From Figure 1, it becomes clear that the amount of the referred cost compared to the estimated cost is noted that there are referred tenders less than the estimated cost and more referred tenders than the estimated cost. When the average is taken for the referred tenders, the average price of the mentioned tender comes out to be 1271.491 MIQ, which is greater than the projected cost; consequently, its sums in the national budget grow.

## 4.1 Cost of preparing designs and drawings in serial tendering

When reviewing the contracts department in Baghdad governorate and revealing the details of the amounts allocated to the designs and plans section for the case studies of the ten schools, it was found that the approved amounts allocated for this item depend on the percentages

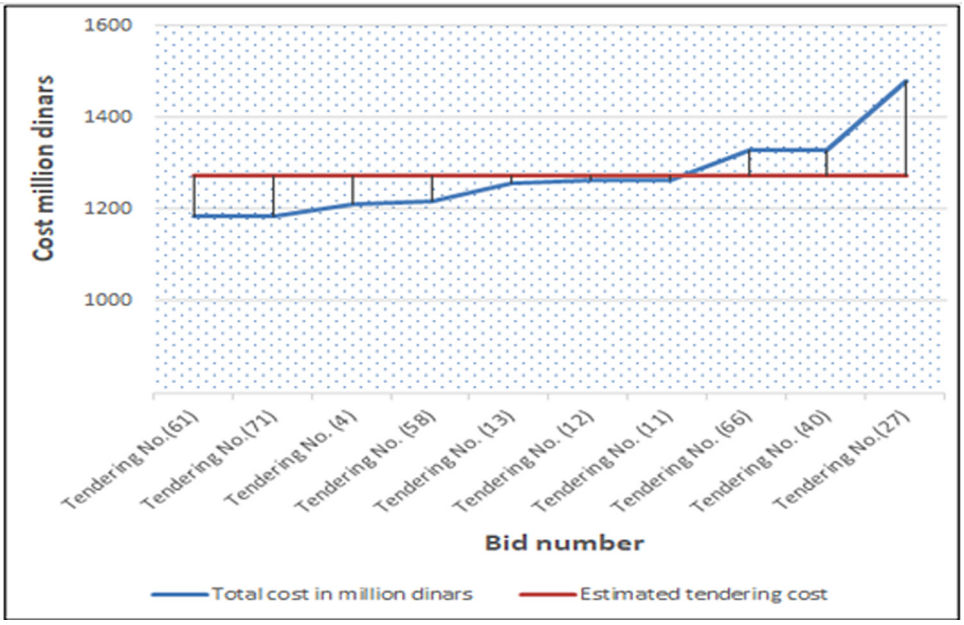


**Figure 1:** The average tender cost awarded in the case study.

approved and issued by the Ministry of Planning (determining the amount of the estimated cost for preparing the designs, not exceeding the percentages mentioned in Table 3).

The initial cost of the project, which is determined within the foundations of feasibility studies for the modified development projects according to the Iraqi Ministry of Planning-Government Contract Execution Instructions No. (2) of 2014 and a (20%), is determined for repeating designs in other locations.

Since the amount, the estimated value price for the project is 1,250 MIQ, according to the table below. Through the estimated price of the tender, and as we conclude from Table 3, the cost of designs represents 4%, or 50 MIQ of the tender cost.

When the same design is repeated, it becomes 20% of 50 MIQ is equivalent to 10 MIQ for other tenders. Therefore, the cost of designs when using continuity and serial tendering is 1.12% of the total tender cost as shown in the derivation of Eq. (1) and as follows:

$$Y = \alpha \star X\ (1 + 0.2 \star (n - 1)), \tag{1}$$

where $Y$ is the design and drawing cost repetitive %, $X$ is the tendering cost, $\alpha$ is the estimated cost of preparing designs from Table 3, and $n$ is the number of repetitive tendering

The cost of designs and drawings is repetitive for ten tenders % = 4% (1 + 20% * 9) = 11.2%

It is divided by ten (the number of repeated tenders) to determine the cost average of designs and drawings for one tender, which is 1.12%, and compare it with the cost of the open tender, which represents 4%

The use of serial tendering will reduce the cost of preparing tender designs and drawings, as shown in Figure 2, where it appears that when using open tenders, the required amount will be reduced by 1.12% instead of 4%, which means that the required amount will decrease

**Table 3:** Estimated cost of preparing designs issued by the Iraqi Ministry of Planning

| Initial cost of the project | The percentage is not more than | |
|---|---|---|
| (in Iraqi dinars) | Local design (%) | Foreign design or partnership contracts (%) |
| Up to one billion | 5 | 6 |
| From one billion to five billion | 4 | 5 |
| From five billion to ten billion | 3 | 4 |
| From ten billion to twenty-five billion | 2 | 3 |
| More than twenty-five billion | 1 | 2 |

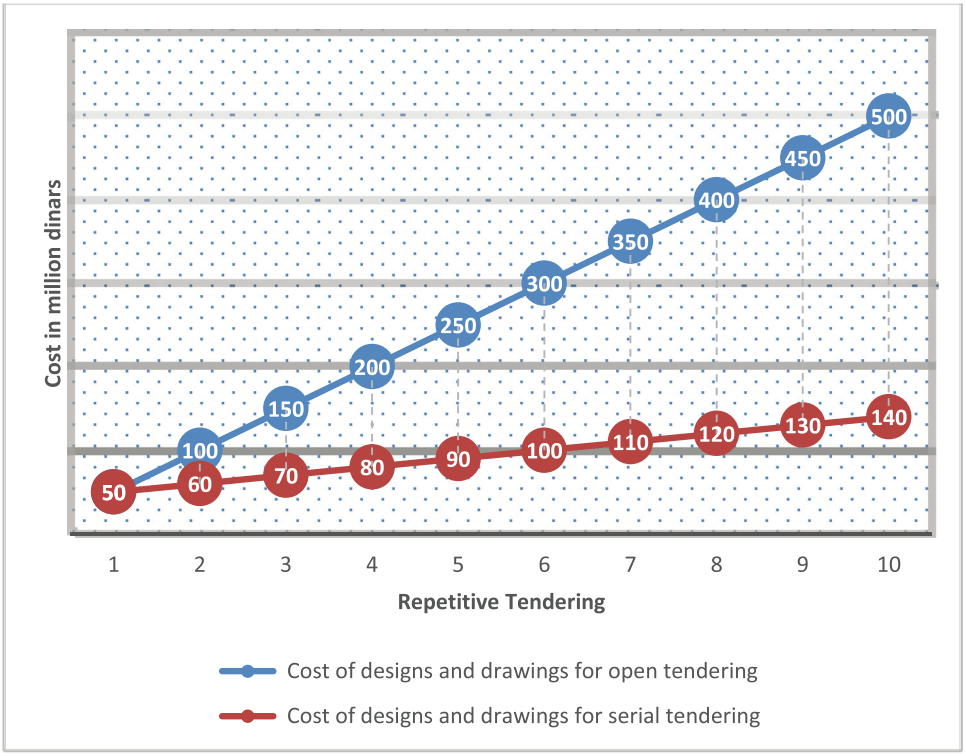


**Figure 2:** Cost of design and drawings in serial tendering.

by 2.88% of the tender amount to provide an amount of 36 MIQ for one tender (360 MIQ) for ten serial tendering.

When bids are repeated and after applying Eq. (1) and drawing the results, it becomes clear that the higher the number of repeat bids, the lower the costs of designs and drawings. These details appeared in the drawing area between the two lines in Figure 2.

## 4.2 Supervision cost in serial tendering

The supervision cost incurred on the ten schools for open tender falls within the second category, Table 4. When using serial tenders, the amount of supervision for the first three repeated tenders within the second category, for 2.5% of the amount of the serial tender and a value less than five billion dinars. For repetitive of four tenders up to seven tenders, the percentage of supervision within the third category 2 is between five and ten billion dinars. For repetitive of eight tenders up to ten tenders, the percentage of supervision within the fourth category is 1.25 is more than ten billion dinars, as detailed in Figure 3. The amount spent on supervision using the open tendering is 312.5 MIQ. The amount spent (156.25 MIQ) on the use of the serial tender is enough to save half of the amount allocated to supervision.

## 4.3 Purchasing tender documents cost in serial tendering

The use of serial tenders will reduce the cost of purchasing tender documents, and through the estimated price of one tender amounting to 1,250 MIQ, the use of serial tenders will reduce the cost of purchasing the

**Table 4:** The Iraqi Ministry of Planning's Supervising and Advising

| Supervising and providing counsel (in Iraqi dinars) | The percentage is not more than | |
|---|---|---|
| | Local (%) | Foreign or partnership contracts (%) |
| Up to one billion | 3 | 7 |
| From one billion to five billion | 2.5 | 5 |
| From five billion to ten billion | 2 | 4 |
| From ten billion to twenty-five billion | 1.25 | 2.50 |
| More than twenty-five billion | 0.6 | 1.20 |

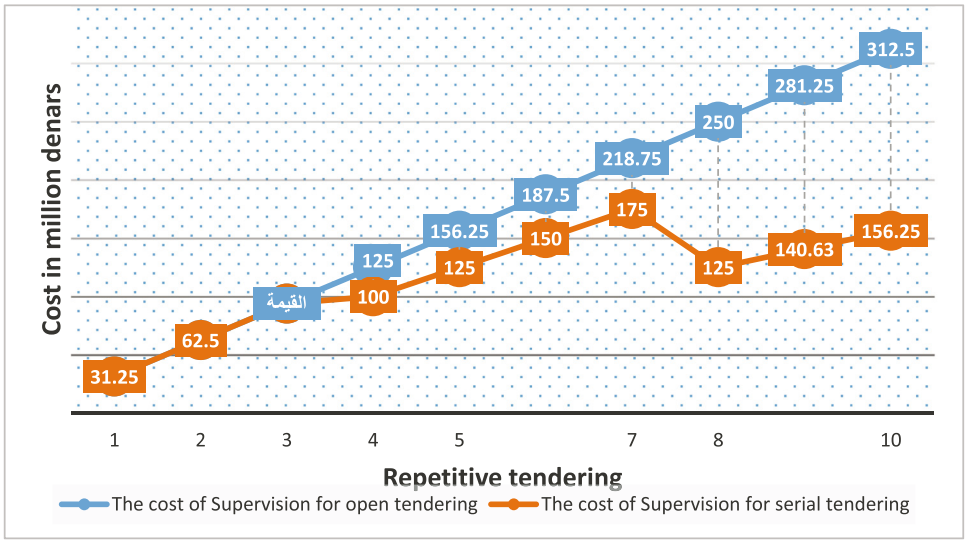


**Figure 3:** Supervision cost in serial tendering.

tender, which shows the amount of reduction that reaches to 50% of the initial cost, as using the open tender; it was found that the cost of purchasing ten tenders amounted to 2.5 MIQ, and it was reduced to 1.250 MIQ using the serial tender. Purchasing the tender documents whose cost has been reduced, detailing them in the drawing area between the two lines as shown in Figure 4.

## 4.4 Financial invoices cost in serial tendering

The data that the Accounts Department deals with in the province of Baghdad were taken, analyzed and converted into information whose details are in Table 2 and divided into the following:

a) The Contractors are subject to a tax (3.3%) of the project cost, which will not alter the rise in the project cost, as long as it remains serial tendering.
b) The engineering insurance percentage is 0.05 of the project cost. After conducting interviews with the employee of the Accounts and Auditing Department and reviewing their records for ten schools in the case study, as well as a visit to the National Insurance Company and The banks affiliated with the private sector that deal with the Governorate of Baghdad, the amount of insurance was 0.04% in the serial tendering, to increase the bid amount to ten times, and

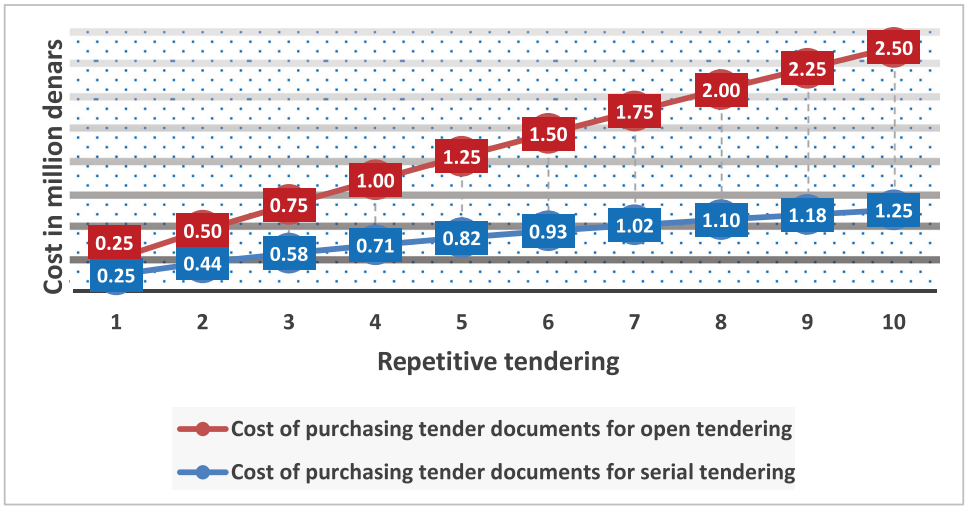


**Figure 4:** Purchasing tender documents cost in serial tendering.

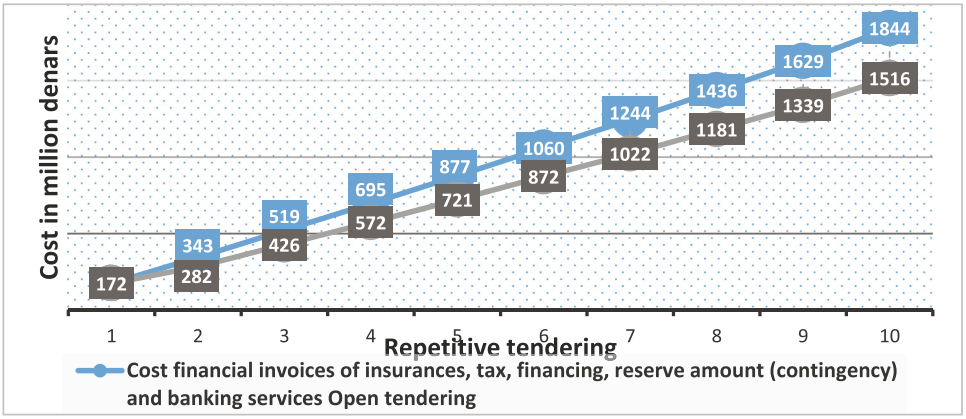


**Figure 5:** Financial invoices cost in serial tendering.

for the exact work requirements, since the percentage of risks will decrease as indicated in the first questionnaire, the second axis (risks and earned value).

c) The (contingent) reserve percentage is 10% of the bid amount using open tenders, and the percentage is 8 when serial tenders are used to multiply the works ten times, which leads to reducing changes, as shown in the first questionnaire, the second axis (change works).
d) The stamp percentage is 0.03 of the project cost, and it is not changed using serial tenders with an increase in the tender price to remain at 0.03%.
e) The percentage of banking services related to financing, transfer of funds, and advances disbursed is 1 in open tenders. However, when the work is repeated ten times, its serial tenders reach 0.5%.

As a result of the preceding, the percentage of financial expenses is 14.5 of the bid value in the open tender. However, when serial tenders are used, the percentage is 11.92, meaning the maximum possible reduction is 2.58%.

The use of serial tenders will reduce the cost of taxes, engineering insurance, reserve percentage (contingent), and banking services from 14.43 to 11.92, as the cost of using open tenders for ten schools is 1835 MIQ, and the cost of using serial tenders 1516 MIQ; accordingly, an amount of (319 MIQ) was provided, the details of which appear in the drawing area between the two lines, as shown in Figure 5.

## 4.5 Administrative expenses cost in serial tendering

Serial tenders led to a reduction in the cost of administrative expenses from 8.5 to 6.5%, where it was found that

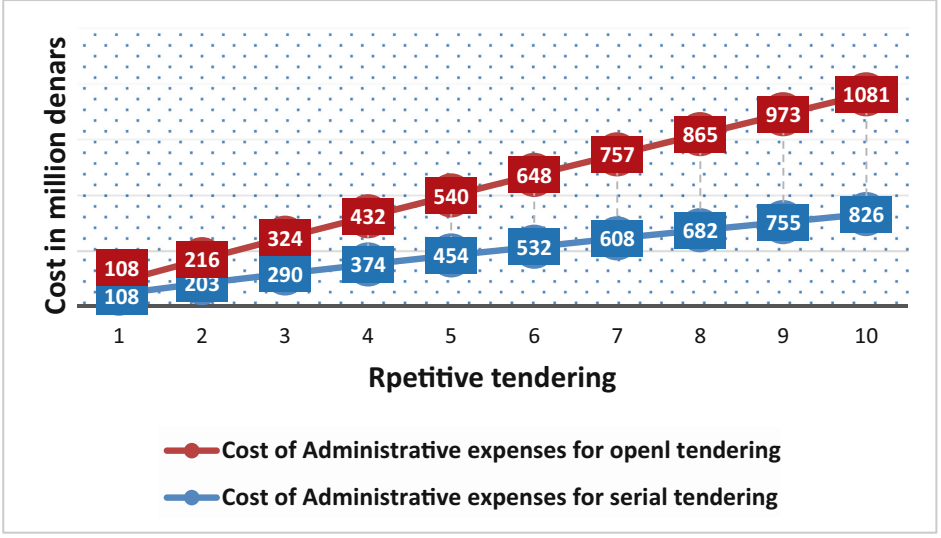


**Figure 6:** Administrative expenses cost in serial tendering.

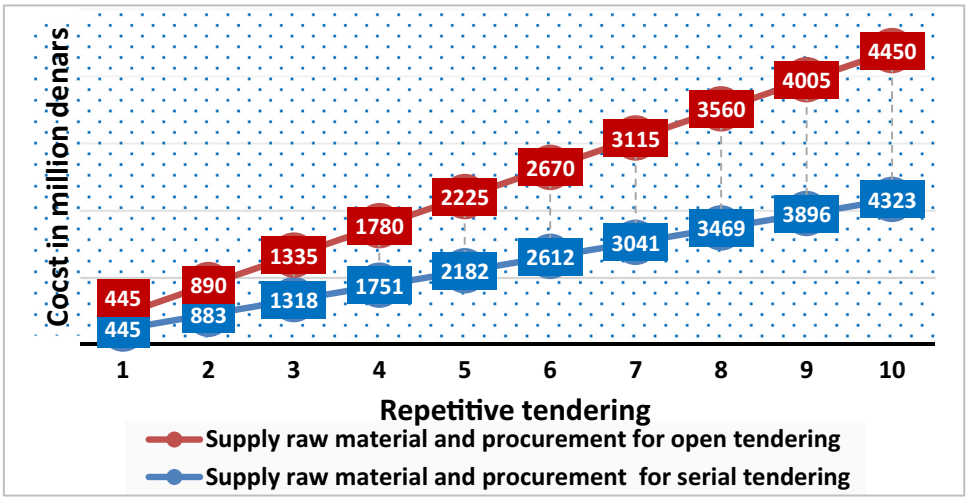


**Figure 7:** Cost of supply raw material and procurement in serial tendering.

the use of open tenders for ten schools will cost 1081 MIQ, and the use of serial tendering for ten schools will cost 826 MIQ. Accordingly, an amount of 255 MIQ was provided. The details of the difference in cost appear in the drawing area between the two lines, as shown in Figure 6.

## 4.6 Cost of supply raw materials and procurement in serial tendering

Serial tenders lowered the cost of expenses related to the supply of raw materials and purchases from 35 to 34%. It was found that the use of open bids for ten schools will cost 4,450 MIQ, and the use of serial tenders for ten schools will cost 4,323 MIQ. Accordingly, an amount of 127 MIQ was saved. Details of the cost difference appear in the drawing area between the two lines, as shown in Figure 7.

## 4.7 Cost of execution (implement) in serial tendering

Serial tenders led to a reduction in expenses related to the supply of raw materials and purchases from 25 to 23 %; it was found that open bids for ten schools will cost 3179 MIQ. On the other hand, serial tenders for ten schools will cost 2,924 MIQ. Accordingly, an amount of 255 MIQ was saved. The details of the fee difference appear in

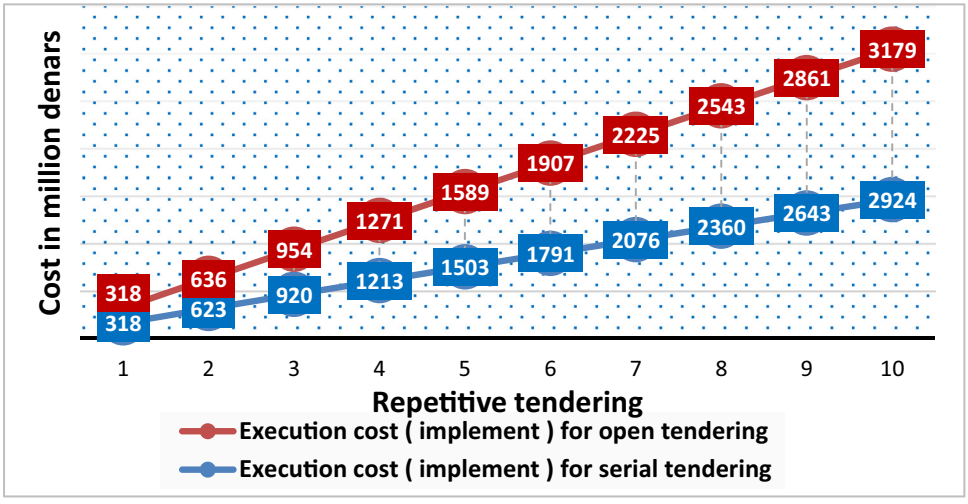


**Figure 8:** Cost of execution (implement) in serial tendering.

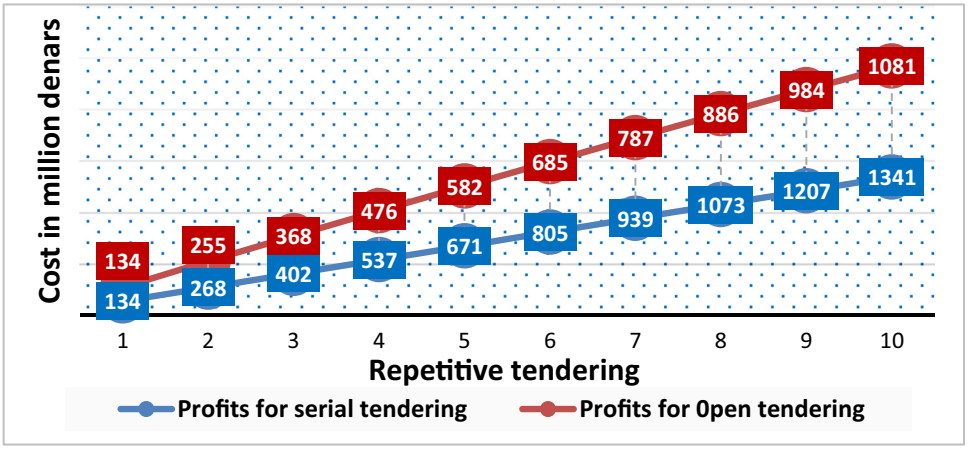


**Figure 9:** Difference in the cost profits between serial and open tendering.

the drawing area between the two lines, as shown in Figure 8.

### 4.8 Profits in serial tendering

The contractor reduces the percentage of his earnings for one tendering when using the serial tendering in order to win the other stages from 10.55 to 8.5% in the case study of the ten schools when using the open tender, the amount of profit is 1,341 MIQ, and for the serial tender, the amount of profit is 1,081 MIQ. That is, the amount of profit reduction is equal to 260 MIQ. The details of the rate difference appear in the drawing area between the two lines as publicized in Figure 9.

## 5 Difference between serial and open tendering in total tender cost

Continuity and serial tendering lead to a reduction in the total cost, where the cost of the ten schools of the case study reached 12714.912 MIQ when using the open tender. When using the serial tender, the total cost is 10967.854

**Table 5:** Project activities that affected by serial tendering

| No. | Activity | | % Open tendering | | % Serial tendering | | Notes |
|---|---|---|---|---|---|---|---|
| 1 | Designs and drawings | | 4 | | 1.12 | | According to Eq. (1) |
| 2 | Supervision | | 2.50 | | 1.25 | | |
| 3 | Purchasing tender documents | | 0.02 | | 0.01 | | |
| 4 | Financial invoices | Tax's | 3.30 | 14.50 | 3.30 | 11.92 | |
| | | Engineering insurance | 0.05 | | 0.04 | | |
| | | Engineering stamp | 0.05 | | 0.05 | | |
| | | Postage stamp | 0.03 | | 0.03 | | |
| | | Reserve amount and contingency | 10 | | 8 | | |
| | | Banking services | 1 | | 0.5 | | |
| 5 | Administrative expenses | | 8.5 | | 6.5 | | |
| 6 | Cost of supply raw material and procurement | | 35 | | 34 | | Difference in reduction = 13.7% |
| 7 | Execution (implement) | | 25 | | 23 | | |
| 8 | Profits | | 10.55 | | 8.5 | | |
| Total | | | 100 | | 86.3 | | |

**Table 6:** Percentages have decreased in cost with repeat bids

| Number repetitive tendering | Percentage of reduction |
|---|---|
| 2 | 3.56 |
| 3 | 6.11 |
| 4 | 7.92 |
| 5 | 9.33 |
| 6 | 10.48 |
| 7 | 11.45 |
| 8 | 12.3 |
| 9 | 13.04 |
| 10 | 13.7 |

MIQ, i.e., a difference of 1747.058 MIQ, with a reduction rate of 13.7% of the bid value, as shown in Table 5. The details of the rate difference appear in Figure 9. It can be saved by reducing the budget required to be allocated by the state.

Table 6 displays the increase in the percentage of reduction when repeating the tender. It was documented that the greater the number of repetitions, the greater the percentage of money savings. When the tender is repeated three times, the percentage reduction is 6.11 of the cost of the tender, and when it is repeated five times, the percentage of the decrease is 9.33. When it is repeated seven times, the percentage of decrease is 11.45, and so on until it is repeated ten times, the percentage of reduction is 13.7 as shown in Figure 10.

Eq. (2) can be deduced from the above results as follows:

$$D = 6.3 \ln(N) - 0.806, \tag{2}$$

where $D$ is the percentage of reduction for cost when repeating the tender and $N$ is the number of repetitive tendering, $1 < N < 11$

From the above, it seems that the amount of difference by reducing tender cost begins with a decrease, as the difference in the decrease between its repetition five times is the difference (8.1%). Also, the difference between the fifth and tenth iteration is 4.6%. In conclusion, the greater the number of repetitions has been gained, the less the difference in the percentage of reduction.

# 6 The total reduce project value on serial tendering

As shown in Table 5, the total project reduction amount is 13.7% and it is possible to a distinction can be made between contractor-related cost reduction versus client-related cost reduction when serial bidding is used in construction contracts.

## 6.1 Client cost reduction percentage from the value project

The Client's reduction percentage depends on some of the items mentioned in Table 5, which were taken from the

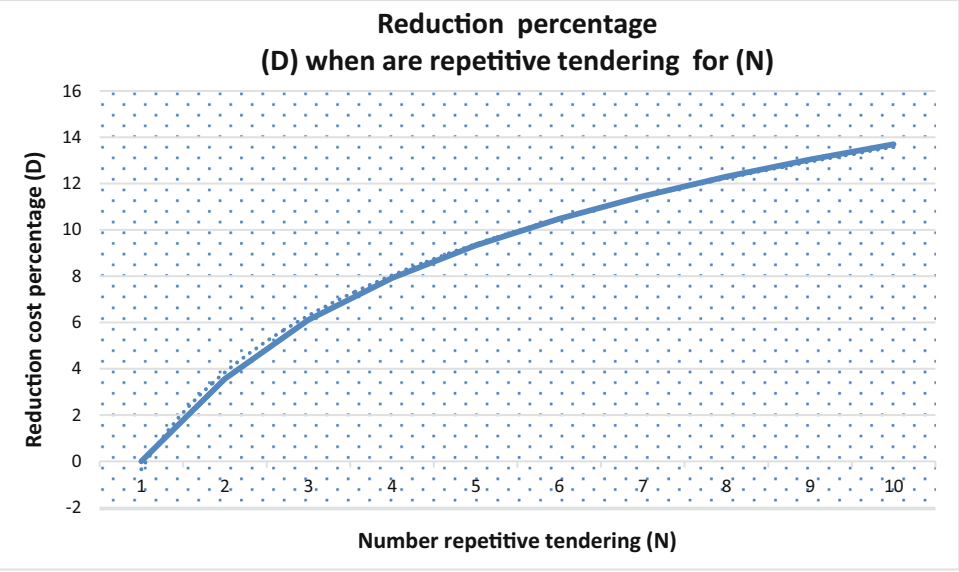


**Figure 10:** The reduction of cost when repetitive the tender.

**Table 7:** Percentage of the cost reduction related to the client from the value project

| No. | Activity | % Open tendering | % Serial tendering | % Reducing |
|---|---|---|---|---|
| 1 | Designs and drawings | 4 | 1.12 | 2.88 |
| 2 | Supervision | 2.50 | 1.25 | 1.25 |
| 3 | Purchasing tender documents | 0.02 | 0.01 | 0.01 |
| 4 | Reserve amount and Contingency | 10 | 8 | 2 |
| Total client reduction | | | | 6.14 |

**Table 8:** Percentage of the cost reduction related to the contractor from the value project

| No. | Activity | % Open tendering | % Serial tendering | % Reducing |
|---|---|---|---|---|
| 1 | Engineering insurance | 0.05 | 0.04 | 0.01 |
| 2 | Banking services | 1 | 0.50 | 0.50 |
| 3 | Administrative expenses | 8.50 | 6.50 | 0.01 |
| 4 | Reserve amount and Contingency | 10 | 8 | 2 |
| 5 | cost of supply raw material and procurement | 35 | 34 | 1 |
| 6 | Execution (implement) | 25 | 23 | 2 |
| 7 | Profits | 10.55 | 8.50 | 2.05 |
| Total contractor reduction | | | | 7.56 |

cost analysis of the projects in the case study, the details of which appear in Table 7, which includes the following items (Designs and Drawings, Supervision, Purchasing tender documents, Reserve amount and Contingency) and to get the estimated total reduction percentage of 6.14 from the value of the project

## 6.2 Contractor cost reduction percentage from the value project

The Contractor's percentage reduction is determined by some of the components listed in Table 5, which were obtained from the cost analysis of the projects in the case study, and are detailed in Table 8, which contains the following: Engineering insurance, Banking services, Administrative expenses, Reserve amount and Contingency, cost of supply raw material and procurement, implement and Profits and to get the estimated total reduction percentage of 7.56 from the value of the project

# 7 Conclusion

The results of this important study of ten schools similar in design and awarded in the same year concluded that one of the important benefits of continuous and sequential bids is to reduce the total cost of the project by 13.7% repetitive ten times and thus reduce the financing required for the project as follows:

a) Reducing the expenses cost of preparing designs and drawings of the project because of the experience gained from carrying out similar and repetitive works with the same requirements by 2.88% of the total project cost.
b) Saving 1.25% of the overall project cost on supervision charges as a result of expertise gained through similar and recurring work with the same needs.
c) Reducing the cost of preparing designs and drawings for the project due to the experience gained from carrying out similar and repetitive works with the same requirements by 0.01% of the total project cost.
d) Reducing the expenses cost of financial invoices (Tax's, Engineering insurance, Engineering stamp, Postage stamp, and reserve amount (contingency)) of the project because of the experience gained from carrying out similar and repetitive works with the same requirements by 2.58% of the total project cost.
e) As a result of having done similar and similar work before, you can cut the administrative costs of the project by 2% of the total project cost due to your experience.
f) Reducing the expenses cost of supply raw materials and procurement of the project because of the experience gained from carrying out similar and repetitive works with the same requirements by 1% of the total project cost.
g) As a result of carrying out identical and repeatable tasks with the same specifications, 2% of the overall project cost may be saved in implementation costs.

h) Reducing the project's immediate profits for one project as a result of the experience gained from carrying out similar and repeated works with the same requirements by 2.05% of the total project cost and, as a result, increasing the contractor's profits as the number of repeat bids increases.

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**Conflict of interest:** Authors state no conflict of interest.

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