Available online at www.CivileJournal.org

Civil Engineering Journal

Vol. 5, No. 8, August, 2019

# Readiness for E-Tendering in the Construction Sector-Designing a Computer Programme

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Received 10 April 2019; Accepted 19 July 2019

**Abstract**

Development of a country is measured by the number and quality of modern and contemporary projects that have been and are being established. As the construction industry is the nucleus for the development of any country, the stages of each project are tracked and monitored. It was found that the procurement stage has the biggest and most important influence in the successful completion of the project with the desired results. This research aims to eliminate corruption in the procurement process, identify the additional factors relating to a contractor's qualification that contribute towards an increase in the quality of the project; designing a computer programme that conducts the tender process electronically to avoid any human contact. The researcher designed a questionnaire which contains a number of factors that would increase the efficiency and quality of the project. The researcher distributed 50 questionnaire forms and received back 46 completed forms. The questionnaire outputs were analyzed by using the SPSS software which can be defined as a software package used in statistical analysis for data. After analyzing the results a nominal group session was held. This consisted of eight employees with technical, financial, legal, and supervisory and IT expertise. The work was collective and many questions were asked. All relevant factors were discussed. It was agreed to cancel three factors only as being irrelevant to the contractor's qualification process. The most significant findings were that if the organizations adopt the E-T system in the tendering process, corruption cases will disappear, the tendering process will be achieved with high level of integrity and transparency, and in order to implement the E-T system, the organization must be ready to change, the employees should have enough courage to adopt the system, and there would be a need for at least one person to play the role of champion/leader.

*Keywords:* Computer Programme; Corruption; Electronic-Tendering; Electronic-Procurement; Joint Venture; Standard Bidding Documents (SBDs).

## 1. Introduction

The construction industry is classified as an information-intensive industry and is described as one of the most important industries in any developed/developing country that is undergoing a period of rapid change. Now a days, the construction industry is also acclaimed as having a great lack of knowledge and awareness about information and communication technology (ICT) and innovative information and web-based communication processes, systems and solutions which may be useful in the procurement, life cycle and delivery of projects [1]. From 2005 to 2018, through the monitoring of the Government Contracts Department for projects and supervising of the contracting process, the defects in the contractual processes were noticed at several points. Consequently, many methods have been restored in solving these problems: the 1st solution was issuing instructions to execute government contracts, followed by issuing

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http://dx.doi.org/10.28991/cej-2019-03091369

Standard Bidding Documents (SBDs), and finally, the establishment of a specialized website for government contracts whose main task is to deliver information in a transparent and equitable manner to all contractual parties.

Publishing on a site in Iraq is similar to the global site DG Market and all government parties are obliged to publish their tenders on this site, and therefore, all interested (registered parties) whether an individual, entity, or a coalition, can view the tender and submit a bid for it. Thus this will have a positive impact in investment because the existence of a healthy contractual environment will generate an open investment area that will be easier to manage, and the projects will yield the best results.

The electronic portal project was not suddenly conceived, but was planned taking into consideration the experiences of other countries, thus benefitting from this. Some of them, such as Korea and Malaysia, were successful and had a leading role in the field of electronic procurement, while some, like Saudi Arabia, faced, like Saudi Arabia, faced failure or had to stop at a certain point and could not complete the project. All government parties will be obliged to implement the contract on the portal while also observing the traditional method meaning that the publication in the newspapers will not be canceled, and purchase of the tender documents would be by the bill only. The existence of corruption cases, absence of transparency and accountability, poor quality of tender evaluation, the delay due to complex processes of the traditional methods, and the need to utilize innovative technologies to gain greater efficiency and cost savings throughout the institutions are the main reasons and justifications for undertaking this study.

The value of this study lies in many practices on e-tendering and their impacts will be discussed in this research. The ministry of planning will benefit from the results of the study, and obtain an idea of how its institutions can effectively manage the portal to improve their performance. This study will provide a competitive advantage for the companies. The research presents additional criteria to choose the most appropriate contractor, and these criteria are flexible and can change or be less or more according to the project. The results of the research were applied in a software programme; this software will be adopted in the ministry of planning to be as a practical application of the portal project.

## 2. Literature Review

This world is continuously changing and uncertain. The construction industry and its participants have to be creative, needing to have enough understanding of the changeable environments, noticing the opportunities, and increasing the existing confidence level for its capability to acclimate. Sharing the information of the project electronically - from inception, design, through construction, and into operation of the project - can be the guide to great efficiency being gained for all concerned parties [2].

Several studies have been conducted on the process of transition from paper to the electronic system. Mahidin et al. (2005) conducted a study on the impact of adopting e-tendering in their contracts. They concluded that the document flow process was reduced approximately from 73 to 30 days. Other benefits involved the reduction in printing and copying costs, halved the total costs on telephone and faxing volumes between the owner and contractors [3], while Kassim and Hussin (2013) concluded that use of electronic system explains nearly 69% of the variance in transparency, 87% in service performance, 79% in efficiency and 67% in information quality. Thus, it can be concluded that the highest success in achievements is on the improvement of service performance, followed by efficiency, transparency and information quality. The results also show that user attitude has a direct influence on the system usage [4].

Oyediran and Akintola (2011) conducted a survey about e-tendering in Nigeria, and they state that the few professionals who have participated in E-T have experienced a low level of savings in costs, and a moderate level of savings in time, and there is need to develop a capacity building knowledge backbone to drive the adoption of E-T [5]. In Australia, Neupane and Yong (2012) conducted a study which found that transparency and accountability are the most important benefits from public e-procurement. Other benefits include increasing competition among bidders, best quality of work and services, and increasing more consistency in government procurement, which helps governments to reduce corruption in public procurement. Most importantly, the study finds that most of the developing countries' government missions and objectives of adopting e-procurement technology are to increase transparency, accountability, real-time access information, and increase competition among bidders, which ultimately reduces corruption in public procurement [6].

Bulut and Yen (2013) studied e-procurement in China and found that the perception and understanding of e-procurement among decision makers and other key stakeholders, in addition to political and institutional support, are prerequisites for E-P implementations and yet are not the only factors that lead to success. And the level of development of E-P within the public sector does not necessarily correlate with the level of development of these countries [7]. Dominic (2014) aimed to establish the e-procurement practices employed by Kenya Revenue Authority (KRA), and to establish the factors influencing application of e-procurement at KRA. He arrived at the result that understanding the E-P concept was a little difficult for organizational stakeholders such as senior management and end-users, a fear of making errors, a lack of confidence, lack of technology and innovation champions within the organizations, In terms of factors,

he found that the factors considered to affect E-P implementation at KRA include organization readiness, the size of the firm, trust, and risk [8]. KRA. He arrived at the

In Bangladesh, Rahim (2014) intended to evaluate the progress of implementation of the e-tendering system. He found that the implementation of the E-GP system has been done very successfully withstanding all the possible challenges. They were very sincere and motivated in doing that. They are giving training to the staff and simultaneously implementing the system, at the same time 99% respondents desired the E-GP system for the free, fair and transparent administration and participation in tenders. But 87% of the respondents needed E-GP training either in refreshing or fresh training courses. Among the respondents, 63% were not satisfied with internet browsing speed, and 28% were not satisfied with bankers support services [9]. In the USA a study had been conducted by Altayyar and Beaumont-Kerridge (2016). The study aimed at investigating and examining the barriers that affect the adoption of e-procurement in four Saudi Arabian SMEs. Weak infrastructure and lack of government support were found to be the most challenging barriers, and quantitative data further established that there was a lack of procurement, specific laws, and mistrust in electronic fund transferring mechanisms by the available options [10].

Pavithra et al. (2018), analyzed the effectiveness and challenges of the E-T marketing system. The significant findings were that the E-T system has considerable potential to increase competition and transparency in agricultural markets, and to reduce costs of trade for both buyers and sellers without negatively affecting their trade relations and revenues. Farmers benefit from E-T, and there is a need to create awareness of the benefits of e-trading among farmers, and build their capacity in online banking and grading of produce at farm level. E-T is successful in larger markets, but not in smaller ones. This is because of several issues related to capacity of the market committee, and fear among traders that with automation they would lose their business to large traders [11].

In Kenya, Nurwin (2018) has determine the effect of regulated electronic tendering on the implementation of preference regulations. The researcher found that tendering processes are accomplished electronically, employees prepare tender specifications electronically, and suppliers are also able to bid electronically. As a result, paper-based transactions are reduced and the marginalized groups are empowered. There is thus need to do all the tendering processes online. This will also bring about a speedy exchange and accessibility of information, ensure efficiency in service delivery and, overall, improve firm performance [12]. In Australia, Al-Yahya et al. (2018) developed a conceptual model to assess the E-T readiness in a construction organization prior to implementation, explore the current level of E-T readiness in construction organizations, and build a theoretical model to assist in the E-T readiness in any construction organization's E-T implementation. The data is collected and refined, validity and reliability of the model assessed by the Delphi method. The search result was that there is a lack in empirical support of the conceptual model for validation, the model contains five themes: People, Process, Work Environment, Technology and Service Providers, and the Service Providers theme with its structures (communication, market and technical) is proposed as a necessary support for successful E-T implementation [13].

## 3. Tendering

Tendering has been considered one of the methods for awarding government contracts (the fairest way) and the most likely way that ensures a favorable outcome of the Government's spending on the general budget [14]. Many types of tenders have been listed in Table 1.

**Table 1. Comparison between types of tendering in international countries and Iraq**

| Country | Major types of tenders to be used |
|---|---|
| Nigeria<br>Malaysia<br>Turkey<br>Kenya<br>India | Open tender<br>Restricted tender (selective tender)(limited tender)<br>Negotiated tender. |
| Iraq | 1- One Stage Bidding (nine methods)<br>• General Tender<br>• Limited Bidding<br>• The general tender in the form of technical qualification<br>• General tender in two stages<br>• Direct invitation<br>• One bid (the only offer)<br>• Direct contracting<br>• Direct purchase from the manufacturers<br>• Procurement Committees<br>2- Two Stage Bidding |

### 3.1. Traditional tendering processes

***1- Internationally:*** Usually the government is considered as the major client in construction sector contract. A client has been defined as the owner of the project. A contractor has been defined as the provider or tenderer. A consultant has been defined as information broker.

The process starts when the client has an intention to undertake a construction project. The client hires a consultant to prepare the tender specification by making a feasibility study. Traditionally, the first step is the declaration that is made by the client over a specified period through printed means like newspapers, the website, or public media. After that, the contractor who wants to submit the bid will buy the documents of the tender, insert the information required, and presents the finished tender prior to the final date of submission, as is shown in Figure 1. The grey boxes represent the main phases in tendering:

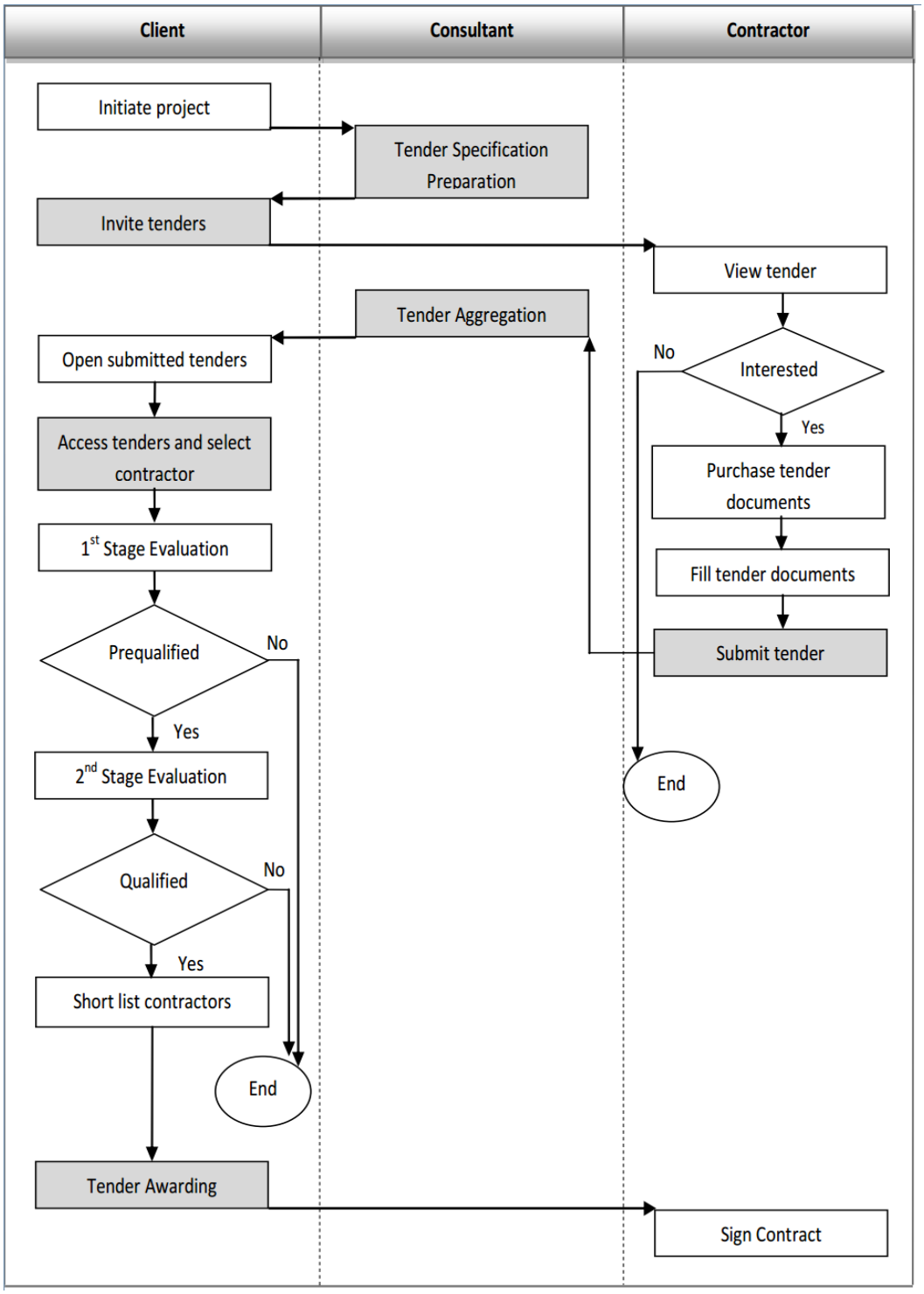


**Figure 1. General tendering processes in the construction industry according to client, consultant, and contractor perspectives [14]**

***2- Locally:*** Figure 2 is a flowchart that illustrates the traditional tendering process locally (in Republic Of Iraq). The researcher obtained it from the instructions of implementation in government contracts in Iraq, and developed it as shown in the flowchart:

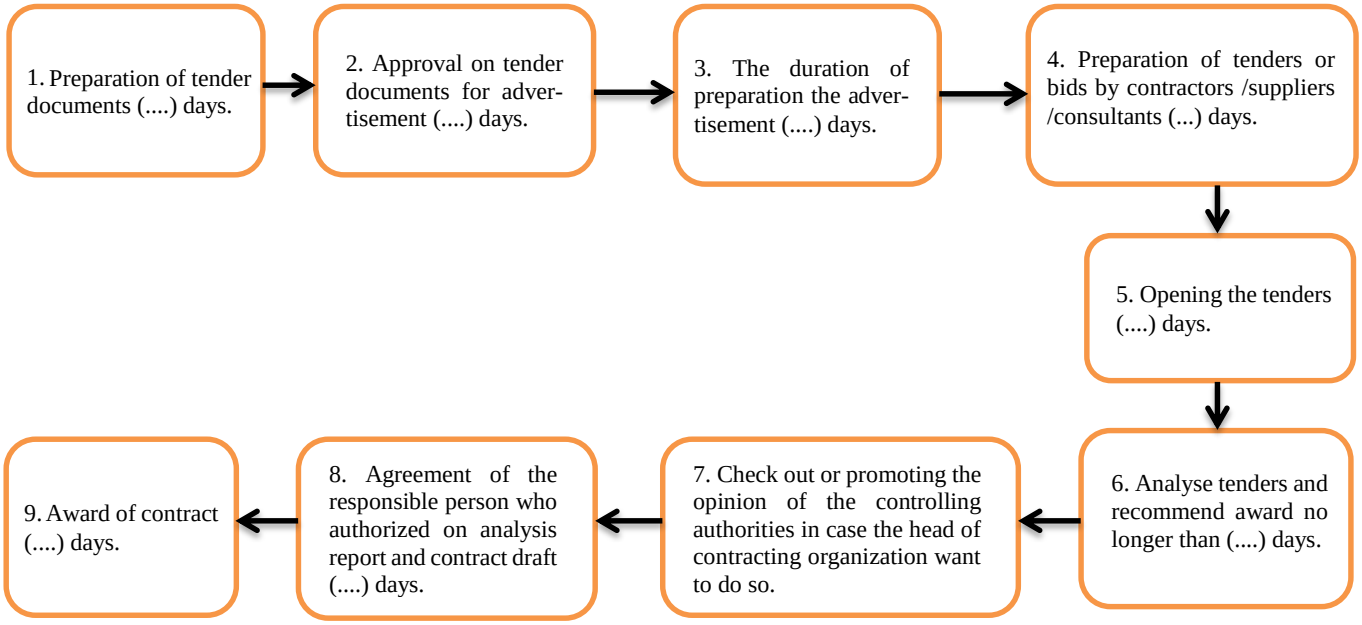


**Figure 2. Flowchart of traditional tendering process locally (in Republic of Iraq)**

### 3.2. Electronic Tendering

Our world today presents no technological barrier – the only likely barriers being the people and the processes themselves, – using ICT in practice and daily work. The National E-T Imperative (NETi) is a national initiative that has merged every action or component of the whole construction tendering into an electronic or digital medium hoping that it can overrun time, economical, geographical, and people-based errors and inefficiency barriers. Thus the process will be faster, more profitable and more efficient for all the participants in this industry [15].

E-T is the process of sending a demand for information and costs to vendors and receiving a reply using the technology of Internet [6, 16].

E-T is basically a term used to describe the publishing and receipt of tender information, receiving of tender documents, a signal of interest in tendering, acceptance of the tender amount and finally choosing of a successful tender through the Internet [5].

E-T is an IT tool that has been highlighted by the construction industry experts to support changing the culture of this industry and improving its operation [17].

Some benefits derived from the application or adoption of electronic tendering in the procurement process are:

- Provide greater opportunities for small and regional firms, and provide improved and safe access to tender information [1, 18].
- Provide remote accessibility to the system [5].
- Better status for monitoring and tracking of applications can be provided by E-T, and direct human contact will be eliminated in tendering and other works and services; internal efficiency to increase in government departments, and corruption will decrease significantly [6].
- Reduces the cost of printing and copying which saves time and resources [17]; up to 90% in preparing, copying and distributing tender documents [19].
- Centralize the tendering process and documents, which allows for easier access to tender documentation by all parties [19].
- E-T system has minimized the tender life cycle by about 43 days, and this results in increasing the document flow speed by about 58.5% [3].

While the risks that can result in the application of E-T is uncertainty, reducing staff, changes in relationships and daily work, create resistance against that change, so it is necessary to recognize champions that act as individual change agents in the team and in the organization [20]. The other risk is that the essential changes in the process may break

existing organizational processes or stopping the organization. Insertion of modern technologies will result in changes. Employees might have to change the way they work to follow-up technology which might led to inefficiency in work, no motivation, disorganization, and some may fear for their job safety [2].

Using new IT solutions, such as e-procurement and e-tendering, represents a strong stimulation to move from a bureaucratic model of administration (based on standard procedures, only committed to rules), to the virtual bureaucracy in which communication is informal and electronic; employees are multi-functional; jobs are enriched in content and "limited" not only by the expertise of the employees, but also by the extension and sophistication of the mediation offered by technologies [21].

## 4. Statistical Analysis of The Questionnaire Data

The questionnaire outputs were analyzed by using the SPSS which has been defined as a software package used in the statistical analyzes of data. The results of the analysis are shown in Table 2.

**Table 2. Statistical Analysis by Using SPSS**

| Item No. | Factor | N | Mean | Std. deviation | Cronbach's Alpha |
|---|---|---|---|---|---|
| 1 | Contractor's compliance with technical conditions and specifications | 46 | 4.78 | 0.467 | 0.984 |
| 2 | Obligation of the existence of the project implementation manager | 46 | 4.63 | 0.572 | 0.983 |
| 3 | Awareness about the existence of the specialist engineer with the team | 46 | 4.59 | 0.652 | 0.983 |
| 4 | Finance situation | 46 | 4.59 | 0.652 | 0.983 |
| 5 | Final calculation for the last three years | 46 | 4.57 | 0.655 | 0.983 |
| 6 | The existence of a system for the management of the project | 46 | 4.54 | 0.585 | 0.983 |
| 7 | achievement of previous projects on time | 46 | 4.50 | 0.548 | 0.984 |
| 8 | Complete the execution of contracts similar to the work successfully and in full quality | 46 | 4.48 | 0.722 | 0.983 |
| 9 | Adoption of the work progress program | 46 | 4.43 | 0.655 | 0.983 |
| 10 | Adoption system of risk forecasting and risk management | 46 | 4.26 | 0.743 | 0.983 |
| 11 | Achievement of previous projects within the budget assigned to them | 46 | 4.24 | 0.639 | 0.983 |
| 12 | Specialized experience (particular period of years of work in the required specialization) | 46 | 4.24 | 0.603 | 0.984 |
| 13 | Existence a program for a quality policy in previous projects | 46 | 4.24 | 0.705 | 0.983 |
| 14 | Adoption of health and safety policy | 46 | 4.22 | 0.696 | 0.983 |
| 15 | Contractor's current status (workload and ability to take over a new project) | 46 | 3.98 | 0.649 | 0.984 |
| 16 | Contractor has have his own mechanical equipment | 46 | 3.98 | 0.745 | 0.983 |
| 17 | Health and safety indicators appear in previous project registration. | 46 | 3.89 | 0.849 | 0.983 |
| 18 | The importance of having a field laboratory | 46 | 3.74 | 0.773 | 0.984 |
| | **Valid N (listwise)** | | | **46** | |

Four questionnaire forms were filled with feedback. The 1st one commented on Factor 5 (making sure that the company is sober and not losing); Factor 13 (preference for bidding); and Factor 14 (contractual condition and within the tender). The 2nd one commented on Factor 11 (as requested by the employer or beneficiary party). The 3rd one commented on Factor 16 also (no stipulation that the equipment should be owned by the contractor, but requiring a rent contract for needed equipment to cover the contractual period for the implementation of the project). The last one commented on Factors 6 and 10 (it is preferable to be a governing criteria at present and in the future); Factor 16 (equipment is important, not necessarily owned but can be rented). And Factor 13 (very important for the present and in the future).

The authors were of the opinion that the factor which obtained the mean less than 4 be cancelled. Firstly, the Factors 1, 2, 3, 4, 5, 7, 8, and 12 are constant (governing) criteria required in the small SBDs. Secondly, the Factors 6 , 9, 10, 13, and 14 have values with means more than 4 and are not required in the constant criteria, so the authors adopt them as a criteria required in the computer programme in addition to the constant criteria, they have been added as flexible criteria in which the employer can change according to the nature of the project. Finally, the factors 15, 16, 17, and 18

have values with means less than 4, so the authors decided to cancel them, but before cancelling them the researcher preferred to conduct more than one method to filter the factors and conducted a session of the nominal group technique to apply rankings to the factors.

The authors showed the factors to the sample for the purpose of ranking the factors that were put forward in the questionnaire. The sample agreed that the second group with the mean above 4 must be adopted in the computer programme, and agreed to cancel the factors that obtained a mean under 4. However, the sample were not in agreement and rejected the cancellation of Factor 16 because it is required in the small SBDs as a constant (governing)criteria and requested to adopt it despite obtaining mean of 3.98 < 4.00.

## 5. Computer Programme

The programme consists of four stages which are divided into constant and variable parts. The constant part which is constant for all projects and tenders, involves the second stage; the first, third, and fourth stages are the formation of the variable part which varies from one project to another.

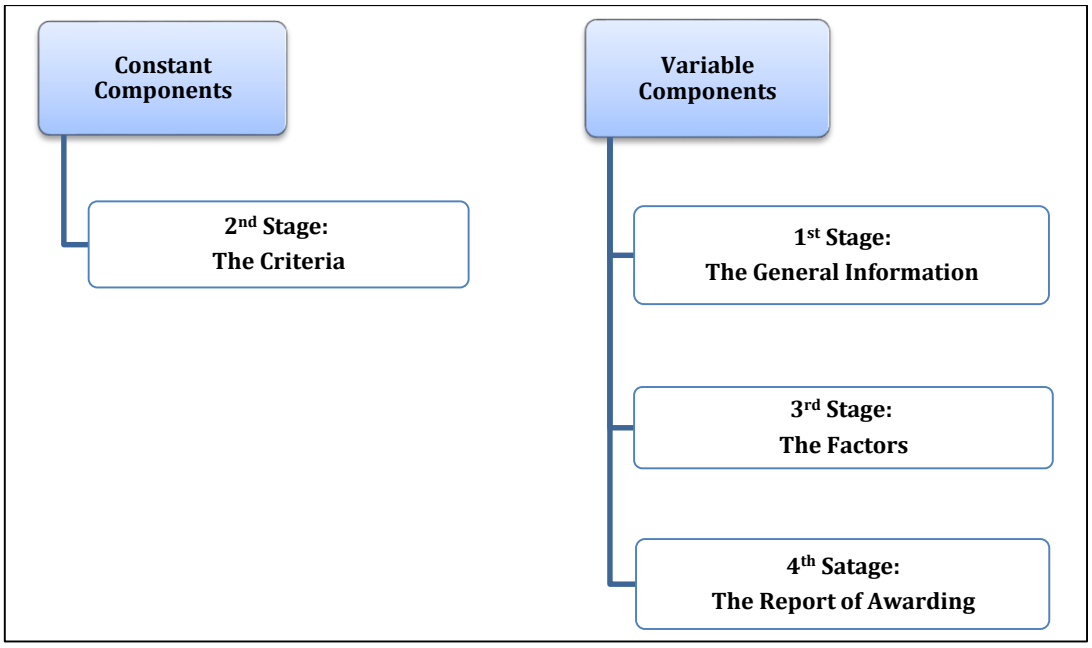


**Figure 3. Components of the Programme**

### 5.1. Programme Methodology

The programme consists of four general steps which are:

- Information about the tender such as the project name, tender number, type of budget, the name of the contracting party and the e-mail address of the responsible official, etc.
- The constant criteria mentioned in the small SBDs, when the user passes it, he will be moved to the next step.
- Third step is the flexible criteria that varies from one project to another and according to the request of the employer.
- The report of awarding to the most appropriate tender.

Before explaining about the program, let us have a simple clarification about SBDs:

***Standard Bidding Documents***

The SBDs are regulatory procedures for organizing the procurement process, which are adopted for obtaining unified and easy-to-filter tenders, and obtain the best in terms of technical offer and the lowest in terms of financial offer. The standard documents are 18 documents, each document used for a specific type of project.

In the case of projects for the construction sector, the public works document is used a lot, which is divided into three types of sub-documents:

- Works document for large projects: for projects with a budget of 10 billion Iraqi dinars (ID) and above.
- Works document for medium projects: for projects with budget of 5-10 billion ID.
- Works document for small projects: for projects with a budget under 5 billion ID.

In this research, the researcher adopted the third type of documents, the small document consists of 8 parts, and Table 3 presents a brief definition of each part:

**Table 3. Parts of the Small (SBDs)**

| No. | Part Name | Part Definition |
|---|---|---|
| 1 | Instructions for bidders | This part is constant, unchangeable or modified. |
| 2 | Tender data sheet | This part contains texts that are filled by the employer (the contracting party). Employer's requirements are clarified in this part, the texts that confuse the employer (in the 1st part) can be treated in this part. |
| 3 | Evaluation and qualification criteria | Fixed criteria to be filled by the employer for the purpose of evaluating the bidders and selecting the most efficient among them, the filling of these criteria varies according to each project and its requirements. |
| 4 | Tender forms | The only part that is filled by the bidder. The bidder takes the forms from the 5th part, fills them and places them in this part, puts all the information such as bill of quantities, staff, equipment etc. |
| 5 | Requirements for works | This part is filled by the employer, it is the requirements of employer from the bidder, such as drawings, bill of quantities, schedule of work for auxiliary items, reserve amount. The bidder fills the fourth part based on this part. |
| 6 | General Conditions of Contract | This part is constant, unchangeable or modified. |
| 7 | Private Conditions of Contract | This part is filled by the employer, The general conditions are dealt with while the employer can establish his own conditions for the project in this part. |
| 8 | Standard Models | This part is non-obligatory, where the employer can be guided by it or left it according to the need. |

## 5.2. The Fundamental Components for the Stages

***1st stage*** components are:

1- Information about the project and the owner (contracting party).

2- Information about the tender.

***2nd stage*** components are the criteria that are requested in the SBDs for small works which are to be filled by the owner according to his requirements under the limitation of the tender, and these criteria are:

- Financial situation

The financial situation of the bidder will be clarified by Table 4 which shows the amount of money required to be held by the bidder to be able to undertake the proposed project.

**Table 4. The required financial situation (small (SBDs))**

| Subject | Request | Single company | Joint venture all partners | Joint venture every partner | Joint venture one partner at minimum | Submission requirements |
|---|---|---|---|---|---|---|
| The cash | The bidder have to provide cash of (__) ID within a period of (__) | Requirements must be met | Requirements must be met | Requirements must be met by (__)% | Requirements must be met by (__)% | Under the cash flow statement* |

- The experience

The experience of the bidder must be as outlined in Table 5.

**Table 5. The required experience (small (SBDs))**

| Subject | Request | Single company | Joint venture all partners | Joint venture every partner | Joint venture one partner at minimum | Submission requirements |
|---|---|---|---|---|---|---|
| Specialized expertise | Participate as a contractor, contract manager, or sub-contractor in (__) contracts for the previous (__) years with a minimum amount of money (__) ID for contracts executed for similar works and have been completed in full quality successfully. | Requirements must be met | Requirements must be met | Not required | Meet | Under the specialized experience form |

- Staff

The bidder has to provide the details of the employees proposed for work in the execution of the contract, specifying their previous experiences, according to the forms*.

- Equipment

The bidder must prove ownership or the acquiring of major equipment; this equipment is presented as a table containing (for each equipment) equipment type, specifications, and required number.

The bidder has to provide the additional details of the proposed equipment to be used in the execution of the contract under the tender form*.

***3rd stage*** components are the factors that have been derived from the questionnaire which are:

- Adoption of the work progress programme.
- Adoption system of risk forecasting and risk management.
- Existence a programme for a quality policy in previous projects.
- The existence of a system for the management of the project.
- Adoption of health and safety policy.

***4th stage*** component is the report of awarding which will be sent to all submitters.

It is important to mention here that the criteria in the second stage are the standards adopted by the Ministry of Planning and other Iraqi ministries, while the factors in the third stage are research material proposed by the researcher and have been added to obtain the highest quality of the project and to choose the best offer and be flexible according to the nature of the tender and according to owner opinion and his request. After the evaluation of the programme, it will be adopted in the Ministry of Planning.

### 5.3. Basic Principles of the Programme

- This programme has been designed especially for projects with a budget less than five billion (5000000000) ID, for projects in the construction sector.
- The fake or incomplete tenders will be automatically rejected and excluded in the 1st stage.
- The success or pass of any tender depended on the fulfilment of the criteria and factors which have been derived from the technical offer.
- After the passing, the programme has to choose one offer from many successful tenders, and the tender that is chosen will be the tender with the least financial offer.

## 6. Conclusion

The most important conclusions are:

- To implement the E-T system, the organization must be ready to change, the employees should have enough courage to adopt the system, and there is a need to have at least one person to play the role of (champion).
- In order to obtain projects completed with highest efficiency, a number of factors were added to be met by the contractor. These factors are placed in the SBDs (exactly in Part II: Tender Datasheet, Additional data to be submitted by the bidder) as part of the owner's requirements which must be provided, and after crossing the ruling criteria and achieving them.
- The characteristics of the computer programme and its terms of reference have been developed and written in cooperation with the Ministry of Planning, which will implement the project soon, and this confirms that the data that were written are real, accurate and realistic with the reality of the current situation.
- By taking the opinions of experts during the nominal group session, many facts have been discovered, the most important is that when the organization adopts the E-T system in the tendering process it will reduce the average price of the tender.
- It has been proved that the transition to the E-T system reduces the cost by converting to an electronic system instead of the paper system, and reduces the time consumed because the system works 24 hours a day and has a remote access feature.

## 7. Funding and Acknowledgement

The study is funded by the Ministry of Planning (MOP) in Baghdad, Iraq. This study is carried out with the assistance and supervision of the MOP. The authors gratefully acknowledge the support received in the success of this study.

## 8. Conflicts of Interest

The authors declare no conflicts of interest.

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