

Optimizing Tendering Process through the Implementation of Improved Version of E-Tendering in a Natural Gas Treatment Company

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Abstract: *This research is aimed to investigate the effect of adopting E-tendering instead of the traditional tendering. It is applied to a real case study on a natural treatment gas company. The e-tendering process was optimized to maximize the benefits and decrease all possible outputs including cost and time. Better idea is obtained on the parameters through literature review on tendering process, and through the instruments used in this study. The instruments included in-depth interviews with experienced individuals and questionnaire survey covering most of the targeted population. The outcomes are used to design a soft file that simulates the systemized tender bid evaluation stage to check the effectiveness of the improved version of e-tendering.*

Keywords: competitive bidding, tendering, e-tendering, evaluation, efficiency

1. Introduction

As organizations and industries requirement are increasing, their capabilities stay limited. Therefore, whenever their capabilities are short; outsourcing will take place through direct single sourcing or competitive bidding. There are two methods of competitive bidding, The first one is the sealed bidding method so called (tendering) where the bidders would submit sealed envelopes containing their bids to the organization and the second method is the auction bidding method where bidders would compete by bidding against each other and the last bidder after all other bidders have stopped bidding wins the bid. (Friedman 1956).

By the end years of the 20th century, tendering became part of most contracting jobs as many organizations would tend to outsource their required service or material in order to obtain the best offer with regard to cost and quality and to ensure competitiveness and fairness to all bidders. (Sayers, 1997). The process of tendering requires a series of stages and steps which consumes a great amount of time and human effort as its controlled by the in-charge employees. Such amount of time consumed and the high interference of human input encouraged organizations to try and improve the tendering process aiming for shorter tendering phase duration and less human interference to assure various benefits such as faster, more efficient and anti-corruption processes.

The aim of this research will be testing the use of ICT tool by implementing an improved version of E-tendering in one of the Oil & Gas Field Companies and check the time saving and others benefit that could be achieved such as reduction of human errors probability and mitigating corruption. This article will conduct literature reviews on traditional tendering and E-tendering processes in order to identify the advantages and disadvantages of both and how E-tendering would enhance the tendering process in the company. Next, a case study and data collection will be conducted on the

company in order to identify the areas where E-tendering can step in and enhance the tendering process and to provide the required data to test the improved E-tendering. Other data will be collected using the mixed method approach by conducting interviews to an experienced persons and questionnaire survey for a sample of workers that work in the tendering field. Once the above data is collected, the data will be statistically analysed and a simulation of the systemised evaluation of tender bids will be conducted using the data of tenders collected from the company to check the effect of the improved E-tendering on the tendering process duration. Finally, the research will present the results and findings of the research and conclude with its recommendations and future recommended areas of future studies.

2. Literature Review

Before the introduction of tendering, any governmental or private organization that wishes to outsource a supply of services / goods, the organization would form a contract with any other party that can provide the services / goods that it's needs. However, such practice was there until the period towards the ends of the 20th century where the competitive tendering process started to kick in industries. (Sayers, 1997)

Competitive Tendering is the process where an organization float a request to multiple organizations to submit their technical / commercial proposal for the requested services or goods. The tender bids then will be evaluated according to the evaluation procedure followed by the organization. Once a tenderer is selected, a formal contract will be formed between both organizations. (Nathan, 2019).

Ever since the competitive tendering kicked in the industry, most organizations started to adapt the concept of competitive tendering and contracting to benefit from its

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recognized advantages. According to Lundburg and Bergman (2017) when an organization cares more about the quality of the services / materials to be supplied by the contractor / suppliers, the organization would choose to go for the “economically most advantageous tender” which is the result of tendering since tendering evaluation criteria in most organizations is based on multiple factors besides price.

As value for money became the new obsession in industries, most organizations tend to move toward “multiple criteria selections” rather than “lowest-price wining” in order to ensure the achievement of value for money in their projects. (Wong et al, 2010)

According to Rimmer, (1998) competitive tendering aims to improve the efficiency and effectiveness of the services delivered by the contractors. Also, it provides a healthy competition and fair opportunity between the contractors leading to wider circle of choice and wider variety of project execution. Not to mention that such healthy competition will create a nourishing industry and will provide all contractors / suppliers with the same opportunity to grow.

Hayes et al. (2016) also believes that a well-prepared tender can enable savings. Among the above advantages, according to Yang and Song (2010), competitive tendering can optimize the resources allocation leading to more savings.

Tendering process:

Although the tendering process might slightly defer from one organization to another, but the entire process of tendering can be generally standardized considering the purpose of each step is the same, even if they look different with different titles. Therefore, we can say that the tendering process consists of many steps and stages, according to (Li Jiabin, 2007) cited from Yang and Song (2010) the tendering process can be divided into three main stages as follows: tender preparation, tender conduction and contract signing. But according to Li Yuan (2008) cited from Yang and Song (2010) the tendering process is divided into four main stages as follows: tender preparation, bidding preparation stage, tender opening and assessment stage, and tender decision stage.

Considering the above stages, our thesis research will focus on the tender conduction and tender opening and assessment stage. These two stages consist of different steps such as: invitation to bid, tender distribution, pre-bid conference, bid submission and bids evaluation and recommendation. (Patil and Waghmare, 2014).

Talking about the tendering assessment stage, some organizations tend to go for the traditional tendering method, where the contractor is selected on the basis of the price of the bid only and the award will be for the lowest. But if the organization is seeking to optimize its benefits financially and quality wise, the award should be done against multiple criteria instead of one criterion which is price. (Fukui and Kobayashi, 2010).

According to Yang and Song (2010) and my humble experience in the industry, the human intervention takes a

big place in the tendering process which increases the chances for human errors and lengthen the period of tender bid assessment. Also, the high human intervention in the tendering process may ease the way for corruption due to the high flexibility in the process.

Time is one of the main factors that is put in consideration whenever tendering process is evaluated. Since traditional tendering consists many stages that rely on hard copies and paper work. A lot of time is consumed starting from the invitation of contractor until the award, such long duration imposes high cost on the company. (Ayoti, 2012).

According to Casady et al. (2019), having a long duration of tendering process can impact the investment efficiency as tenderers will not be free waiting from the time of invitation to the time of award. Such long duration might put the contractor in a position to take another new project and regret at the time of bid submission.

Having such lengthy process due to the dependency on paper work and hard copies have great impact on the required time for the tendering process which reflects negatively on the cost of the process as it requires more staff and working hours. (Adedeji et al., 2017).

Moreover the length of duration effecting the tendering process, the unethical practices done by individual in organization through the traditional tendering process is a great threat to the development of countries. Such unethical practices thrive in the tendering process where the transparency levels are very low. (Ayoti, 2012).

When corruption is mentioned in tendering, the main activities that an unethical individual can commit would be; administrative interference, illegal award of contract and disclosure of confidential information to other contractor before the tendering. Such activities could exist in the traditional process because of the dependency on the hard copies and paper work. (Patrick, 2006).

According to Adedeji et al. (2017), the traditional tendering consists a huge and bulky amount of paper work that need to be completed in the process of tendering. Such process requires a lot of time, cost and in the same time it harming the environment as it consumes a huge amount of papers.

Having this paper work with this huge number of hard copies, increase the probability of document loss or delay while transported from one location to another. Such loss of paper can cause missing of some documents in the tender documents which will lead to delay in the tendering process due to contractor clarification. And in the case where the contractor did not notice the missing document, this might cause in mistake in costing the scope of works leading to tender variations. (Ugochukwu and Okolie, 2013).

As the 21st century kicked in, the fast movement of Information and Communication Technology (ICT) utilization took part in almost everything. And Tendering process was one of the things that was affected by the movement leading to the founding of E-tendering. The term E-tendering is defined as the tendering process that takes

place using the online means provided by the ICT. (Al-Yahya and Panuwatwanich, 2018).

E-tendering can be defined as the issue and receipt of tender documentation through electronic means which facilitates the procurement of services or goods and it involves the submission of tender offer documents to a secure system hosted by the organization. (Betts et al, 2006; Tindsley and Stephenson, 2008).

E-Tendering has couple of critical benefits for organizations who decide to implement it, such as saving time and money spent on tendering using the traditional paper-based method as the E-tendering will streamline the entire tendering process and will increase the competitiveness among tenderers. Using E-tendering should reduce the cost of tender preparation and distribution. (Kajewski and Weippert, 2004).

As a result, for saving time and money by implementation of E-tendering, productivity will increase leading to organization market share increase eventually.; Lenin, (2011). E-tendering takes place using the online means provided by the (ICT) and excluding the old means such as telephone, fax and physical document exchange. Such use can help in monitoring and controlling project activities according to the project plan through effective communication means provided by ICT (Mukelas and Zawawi, 2012).

According to Lavelle and Bardon (2009), Nawi et al. (2016) and Kajewski et al. (2001), Sayed et al., (2019), Lindsley and Stephenson, (2008), there are multiple benefits for E-Tendering as follows: less administration costs for paper work, quality bidding, improved two-way communication between the parties (contractors and sub-contractors), faster response to enquiries, efficient timeliness, help in analysing the tenders, cost savings, reduction in financial and technical risks and increase in competitiveness between contractors and promote overall e-commerce imitative.

According to Lou and Alshawi (2009), as E-tendering will replace the traditional and tedious paper work and hard copies required for the tendering process, employees will start to show motivation and better attitude to the duties assigned to them which will reflects positively on their productivity. Such reduction in paper work and shifting the dependency from the hard copies to soft copies will enhance the accessibility to current and previous tender documents. (Woodhams, 2001).

According to Mukelas and Zawawi, 2012, E-tendering is one of the ICT applications that can be utilized to enhance the efficiency of tendering. Such use of ICT for the process of tendering will result in cost and time savings, improvement in the communication among tendering parties and contributing in trust building and transparency among tendering parties. (Ajam et al., 2010).

As transparency is one of the main objectives of all organizations, E-tendering well help the organization in achieving the highest standards of transparency as it will cartelize all the information and documents used for the

Tender which will make the data accessible by all parties. (Eadie et al, 2007).

Implanting the e-tendering will also provide equal chance for the tenderers throughout the tendering process “registering, tender document collection and submission” as the source will be available for all of them at the same time and can be accessed for all of them at the same time from one source. Such system will increase the probability for some of the contractors to win, leading to equalizing the opportunity to win in the tender for all of the contractors. (Al-Yahya and Panuwatwanich, 2018).

One of the benefits of e-tendering is the support for anti-corruption movement. According to Neupane et al (2012), corruption is defined as the misuse of entrusted power for private gains. E-tendering is considered as a powerful tool that an organization can be used to ensure the transparency, enhance the efficiency, enhance monitoring and tracking, and increase accountability and economic performance of the organization. (Neupane et al, 2012).

According to Neupane et al. (2012), e-tendering will also help in the following areas: Centralization of the data by e-tendering can improve the audits and analysis of the data, and elimination of human interaction on the bidding process which will lead to reduction of corruption significantly.

Because tendering process consist a lot of tedious steps such as tender documents preparation, tender publishing, receiving of hard copies of tender bids, checking and assessing all tender bids manually and then evaluating the tender bids to come up with the award recommendation, these steps impose costs to the organization through manpower time spent for the steps, number of hard copies printed and using mail for hard copies. As E-tendering uses the ICT for its process, a total estimate of 10.4% of cost saving in will be resulted in the tendering process just by adopting E-tendering for running tenders. (West et al, 2009).

Challenges to E-Tendering:

As usual, the adaption of new system or practice faces some challenges that has to be mitigated by the users of the system. The adaption of e-tendering faces the same issue as some contractors / suppliers have difficulties in using the E-tendering system in the beginning until they get used to it. (Kajewski and Weippert, 2004).

One of the major challenges that E-tendering might face would be the resistance of change attitude by the employees of the company which would be driven from their lack of awareness, skills limitation, transparency in the organization, poor cross-disciplinary communication, a fragmented supply chain, and poor industry standards for information interchange. (Al-Yahya and Panuwatwanich, 2018).

Along the above-mentioned challenge, there are security concerns by the users on using E-tendering system on both levels of the organization side and the contractor / supplier’s side, which plays a good rule in the hesitated intention of adapting the system. Security concerns include the openness of data and information through the ICT network fearing for

it to be compromised. (Nawi et al, 2016; Kajewski et al, 2001).

According to Al-Yahya and Panuwatwanich (2018), organizations that have poor and old infrastructure for ICT would face difficulties in the implementation of E-tendering. It would be a great challenge not to mention the great cost that would have to be spent in order to adapt the advanced software that would provide the right foundation of E-tendering implementation.

3. Methodology

The research adopted the mixed method approach for collecting data as it will be using both the quantitative and qualitative methods by conducting case study, interviews and questionnaire survey covering the subject of tendering. The reason behind choosing the mixed method approach was to make sure that our assessment will be depending on data gathered by multiple methods to ensure the comprehensibility of the research outcomes. (Ivankova et al, 2006).

In order to check the validity of our questionnaire survey, validity test was conducted for the gathered responses to check the accuracy and strength of the survey in measuring what it is supposed to measure. Pearson's Coefficient of Correlation was calculated for the gathered responses and the calculated Spearman's coefficient of correlation for the indicators of the questionnaire is a statistically significant relation ($p=0.01$). This indicates that the indicators are valid to meet the research objectives and further analysis can be proceeded.

Also, reliability test was conducted for the gathered responses to check the degree of consistency for the responses. Cronbach's Alpha coefficient was calculated for the gathered responses and result showed that our gathered responses are reliable and further analysis can be proceeded.

4. Results and Discussions

The case study, interviews and questionnaire survey were analysed in order to support the research objectives. The data analysis was conducted using Statistical Package for Social Sciences (SPSS).

Case Study:

The company picked for the case study carries out its outsourced activities through tendering as it believes in provision of an equal opportunity for all the contractors and suppliers when it comes to outsourcing of a service or procurement of materials, the company has adapted tendering for all procurements which is estimated to cost more than BD.10, 000/-.

This tendering procedure consist of multiple stages that could be summarized in the following order:

Stage # 1:

- 1) Generation of Contract Compliance Request.
- 2) Issuing of Willingness Faxes to contractors.

Stage # 2:

- 1) Generating of List of Nominated Bidders.

Stage # 3:

- 1) Generation of Pre-tendering Checklist.
- 2) Issuing of Collection Faxes to Contractor.

Stage # 4:

- 1) Tender Collection and Opening.

Stage # 5:

- 1) Generation of Tender Evaluation and Recommendation.

Stage # 6:

- 1) Generation of Tender Evaluation Checklist.
- 2) Issuing of Letter of Acceptance to the Awarded Contractor.

Company's Historical Data:

In order to have a better idea about the tendering process of company and to assess the current situation of the process, we can identify the area where an improvement could be implemented and approximately measure the actual duration required for each stage of tendering.

Data of 100 tender documents was gathered and analysed using descriptive analysis to find the right measure of central tendency. The main reason behind doing the analysis was to find if there is any skewness in the data collected, since skewness can affect the accuracy of the regular measure of central tendency (the Mean).

In the situation where the data is skewed, the Median is better represented to work as central tendency measure since it's not distorted by outliers and skewness. (Manikandan, 2011)

5. Observations

Considering the analysis conducted and the points highlighted above, the following observations were enquired:

- As start, the first stage of tendering requires around 5 days on average, 3 days for generation of Contract Compliance request and 2 days for issuing of Willingness Faxes to contractors.
- Generation of the List of Nominated bidders as a second stage requires approximately 18 days as per the data analyzed. The reasons behind requiring 18 days are the approvals to be obtained and that all these approvals are done manually through paper work.
- For the third stage, the approximate time required for generation of Pre-tending Checklist and issuing of the Collection faxes for the contractors is around 14 days. The reason behind the time consumed in this stage would be caused by the compliance validation meeting that would be conducted to check the compliance of the tender with company procedures and the approvals to be obtained for the checklist and the faxes through manual paper work. The time needed for validating the checklist is around 5 days on average.
- As for the fourth stage, the approximate time required for tender collection and opening would be around 27 days. Such long duration can be justified by the time needed

for the contractors to come and collect the tender as they would have to come personally to the company Head Office to collect the hard copy of the tender document. Once the tender documents are collected, a pre-tendering meeting would have to take place to make sure that all contractors understand the scope of work requested in the tender document and to clear any misunderstandings or ambiguities before tender closing. After the submission of tender bids by the contractor, the sealed bids would be delivered to the opening committee for opening, this stage takes time since the committee needs to check and sign each commercial page in the bid for authentication.

- Once the sealed bids are opened, the evaluation takes place as the fifth stage. Considering the analysis of the result, the time required for the stage can be approximated to 15 days. The time consumed can be justified by the number of bids collected and technical evaluation required for the tender bid. The person in charge of the evaluation has to be very accurate in checking and evaluating the bids to ensure an award clear of any arithmetical errors or mistakes.
- Coming to the sixth and last stage, the generation of Tender Evaluation Checklist and issuing of Letter of Acceptance would take approximately 11 days. In these 11 days, the Compliance section would conduct a meeting to check the tender evaluation compliance to the company procedures, where only then the Letter of Acceptance would be issued. The document approvals would be obtained manually through paper work. The time needed for validating the checklist is around 5 days on average.
- In total, considering the total duration of the data collected for the 100 tenders. The approximate time required for awarding a tender starting from stage 1 and finishing in stage 6 would be around 111 days.

Considering the current process that the company is using for tendering, it is clearly observed that one of the main challenges they are facing is the high dependency on hard copies and paper work throughout the tender stages. In the unfortunate situation, such paper work and hard copies could be delayed through the route for approval or even lost. It is also observed that through the tendering process, there are meetings conducted with Compliance section to ensure the compliance of the tendering process with company procedures. Such meeting could be time consuming.

Case Study Findings Summary:

After discussing the observations above, the findings can be summarized as follows:

- 1) The entire tendering process is depending on huge amount of paper work and hard copies.
- 2) The duration of tendering process from the willingness invitation till the award is lengthy.
- 3) The tendering process of the company contains many steps and stages. A study needs to be done to remove redundant and time-wasting steps.
- 4) Human error probability is considerably high due to the huge amount of paper work and human intervention in the tendering process.
- 5) Accessibility to historical data of old tenders is difficult due to the conventional archiving method, i. e., hard copies are kept in box files.

- 6) High rate of human intervention which increases the probability of corruption.

Interview and Questionnaire Survey:

Interviews were conducted to gather information from individuals that has been working on the tendering process in the oil and gas industry for more than 10 years. All these individuals have great knowledge and experience in tendering as they are / were practicing tendering on daily basis. The purpose behind the interviews was to cover the following areas:

- Challenges to traditional tendering.
- Methods of improvement for the traditional tendering.
- Advantages and disadvantages of E-tendering.
- Willingness of organization to adopt E-tendering.

On the other hands, questionnaire survey was conducted on specific targeted population that practice tendering and E-tendering in their job to cover the following main areas of interest:

- Advantages and disadvantages of traditional tendering.
- Advantages and disadvantages of E-tendering.
- Challenges to adopt E-tendering.
- Willingness of employees and organizations to adopt E-tendering.

The results obtained from the survey were analysed using one way ANOVA to check and T-Test the difference between the mean of the collected data in accordance to the various demographical data and almost all analyses showed that there no statistically significant difference ascribed except for some and those were triggered because of different work environment and working position.

Even in those indicators where there were differences in the means, the opinions were the same with slight differences. Such result indicates that regardless of the difference caused by the demographics of the respondents, the opinion of the respondent is the same which means that the opinion is unanimous and provides strong support for the claimed advantages for E-tendering and disadvantages of traditional tendering.

Systemizing of Tender Bids Evaluation Stage:

Since one of the objectives of the research is to introduce an improved version of E-tendering, the enhancement was presented as systemizing of the tender bids evaluation stage. Usually, the evaluation of tender bids in the traditional tendering process is carried out as follows:

- 1) Receive the opened hard copies of tender bids.
- 2) Check the completeness of the tender bid documents.
- 3) Tabulate the figures provided in the tender bid.
- 4) Conduct the calculation needed to score the tender bids manually or through software (i. e., MS Excel).
- 5) Generate the evaluation and recommendation memo for management approval.

Since the above steps requires a lot of focus to avoid any arithmetical errors which consumes a lot of time. Also, according to the interviewee's responses, the evaluation stage requires a lot of data tabulation and calculations to come up with the award recommendation. Systemizing this stage will hugely shorten the time consumed by the evaluation stage and errors will be totally avoided.

Along-with the above advantages of the systemized evaluation stage, having a full systemized stage in the process of tendering which runs calculations for big numbers of data and providing the user with finalized evaluation and recommendation report is a great add-on to the enhancement of tendering process efficiency which is the most important indicator of adopting E-tendering according to the questionnaire survey respondents RII result.

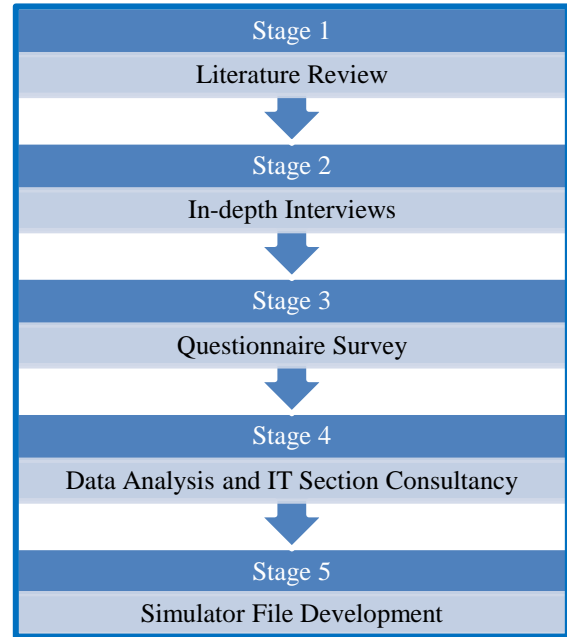


Exhibit 1: Simulator File Development Plane

In order to prove this claim, a soft file was designed and programmed as per the development plan shown in Exhibit 1 using MS Access to simulate the systemized evaluation stage. Screen shots were taken to show the way the file is designed in order to carry out the simulation imitating the way the operation of the systemized evaluation software.

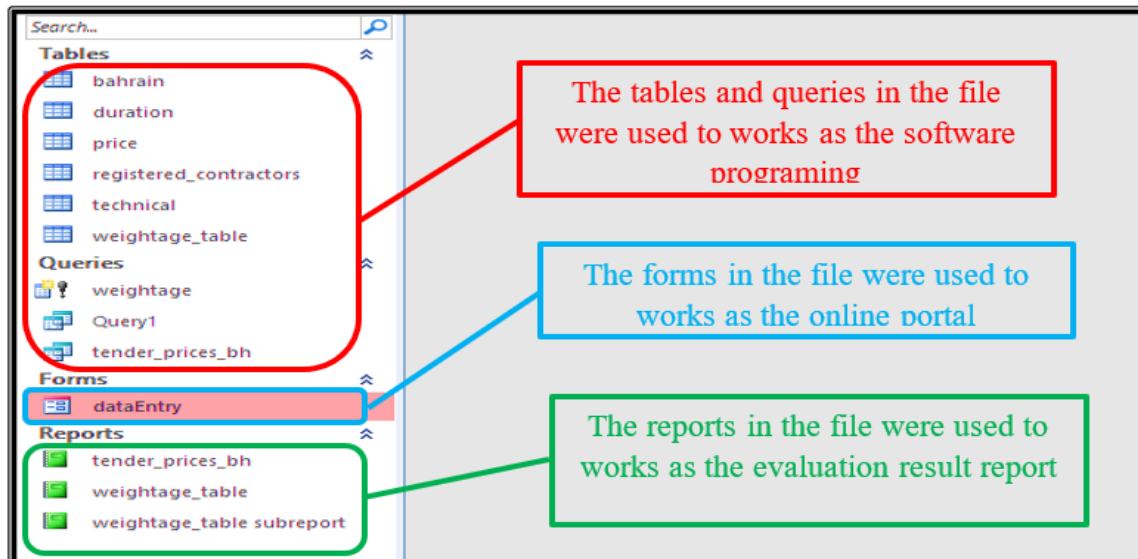


Exhibit 2: MS Access File Logic of Work

In Exhibit 2, the screen shot shows the working logic of the MS Access file created to simulate the systemized evaluation stage. Tables were used to function as the programming of the systemized evaluation software (i. e., archive, database, mathematical formulas, etc.). Forms were used to function as the online portal where the contractor

will have to login and input their bid information, attach their tender bid documents. Reports were used to function as the result of the systemized evaluation result's report where all the required information need for the management approval is presented.

Exhibit 3: MS Access File Entry Form for Tender Bids Data

In Exhibit 3, the screen shot shows the form used for entering the data of the tender bids as if the contractors were inputting their tender bids information and documents during tender bids submission.

Contractor Code - Name	Price	Weight	Bahrainization Weight	Technical Weight	Duration Weight	Total Score
RAM - Ramsis Engineering	188,890.000	1.000	11.760%	1.043	1.000	150.000 0.800 3.843
BMD - Bahrain Diving maintenance	230,900.000	0.818	13.530%	1.200	1.000	300.000 0.400 3.418
NAM - Nasser Abd-Mohammed	266,164.940	0.710	11.670%	1.035	1.000	180.000 0.600 3.411
MCS - Mechanical Contracting & Services Company	295,229.000	0.640	4.870%	0.432	1.000	240.000 0.500 2.572
AMA - Ahmed Masoor Al-Aali	351,722.000	0.537	6.620%	0.587	1.000	300.000 0.400 2.524

As per the Above scoring, the recommended Tenderer for award is **Ramsis Engineering** with total score of: **3.843**

Exhibit 4: MS Access File Evaluation Result Report

In Exhibit 4, the screen shot shows the evaluation result report generated by the MS access file where it displays all the information required for management approval.

The above-mentioned MS Access file was tested on 10 tender bid data to test the logic of the software and it proves that it works perfectly without any errors or glitch. The result report is generated in less than a second.

Effect of the Proposed Improved E-tendering on the Company Tendering Process:

Reference to the findings and observations mentioned in the case study section. Here, the researcher will demonstrate the effect expected to be achieved from implementing the improved version of E-tendering on the company tendering process.

As the company tendering process consisted of three steps in different stages that are related to compliance section in the company as follows:

- Generation of Contract Compliance Request.
- Generation of Pre-tendering Checklist.

- Generation of Tender Evaluation Checklist.

These steps take place in the process to ensure the compliance of the tendering process to company procedures since the process is being done using paper work and relying on hard copies. If E-tendering is to be adopted by the company for its tendering process, these three steps can be eliminated from the process as the tendering process is systemized and such compliance testing will have to take place one time during the E-tendering software programing.

By eliminating these steps from the tendering process as they will be redundant and time wasting if E-tendering is to be adopted, the time required for each step will be deducted from the time need for each stage, hence tendering process total duration will be shortened.

In Exhibit 5 below, we can find the total time required for tendering process for each method of tendering (i. e., traditional tendering, E-tendering and the improved E-tendering). The following conditions was put in consideration while constructing the table:

- Traditional tendering duration was obtained from the company case study.
- Elimination of compliance validation steps during E-tendering as they are no longer required as explained above.
- E-tendering reduces the duration of traditional tendering steps to 70% as per Tatweer experience received from Mr. Ammar interview.
- Improved version of E-tendering reduces the time of evaluation to 0, and 4 days only will be considered for management approvals to the recommendation.

Exhibit 5: Effect of the Proposed Enhanced E-tendering on the company Tendering Process

Tendering Stage	Step Refer to Case Study	Time Required (days)		
		Traditional Tendering	E-tendering	Improved E-tendering
Stage # 1	Step.1	3	-	-
	Step.2	2	2	2
Stage # 2	Step.1	18	13	13
Stage # 3	Step.1	5	-	-
	Step.2	9	7	7
Stage # 4	Step.1	27	19	19
Stage # 5	Step.1	15	11	4
Stage # 6	Step.1	5	-	-
	Step.2	6	5	5
Total Duration (days)		90	57	50

As we can see in Exhibit 5, the improved version of E-tendering proved that it can provides faster processing duration than then other two tendering process because of the systemized evaluation stage, and in the same time it provides all the advantages achieved by adopting the regular E-tendering which can be summarized as follows:

- Reduction in the amount of paper work and hard copies required in the tendering process.
- Enhancing the efficiency of the tendering process.
- Enhancing the company transparency and anticorruption standards.
- Minimizing the human intervention, thus minimizing of human error rate.
- Enhancing the communication means with the tenderers.
- Improvement of archiving system in the company.
- Enhancing of management control on the tendering process and traceability through the tendering process.

The above-mentioned advantages solved all the disadvantages of traditional tendering received in the interviews and questionnaire survey response.

6. Conclusion and Recommendation

6.1 Conclusion

Based on the result analysis and discussion, the conclusion is drawn as follows:

- 1) According to the interviews conducted for 10 experienced individuals, all interviewees agreed that E-tendering will reduce the duration of tendering process. According to the experience of Tatweer witnessed by Mr. Ammar shows that adopting E-tendering have reduced Tatweer's tendering process from 3 months to 2 months. Also, according to the 91 questionnaire survey responses received, the RII% for the indicator of

enhancing the efficiency of the tendering process was calculated to be 89.565% which is considered as high importance level. Hence, one of the gains that will be achieved by this enhancement in efficiency will be time reduction in the duration of tendering process. Moreover, according to the literatures reviewed, shortening of tendering process was one of the main advantages of adopting E-tendering.

- 2) Based on the result we found by testing the MS Access file which simulates the proposed improved version of E-tendering evaluation stage, it is obvious that the improved version will optimize the tender bids evaluation stage as it reduces the duration required for evaluation of tender bids in the traditional tendering to 1 second. The only time balanced in this stage would be for the management approval which should not be more than 4 days. The File was tested on 10 tender bids from the historical data collected from the company and it shows that the evaluation of tender bids takes only 1 sec as it is fully systemized.
- 3) According to the tests carried out using MS Access file for 10 tender bids, it was clearly observed that the result of the evaluation was clear of any arithmetical error which indicate that the improved version of the E-tendering will eliminate human error in the tender bid evaluation as the evaluation calculation will be carried out by the software, away from any other human intervention.
- 4) According to the 91 questionnaire survey responses, E-tendering helps in enhancing the organization transparency and anti-corruption movement. The RII% for this indicator was calculated to be 84.928% which is to be considered as high importance level. Such enhancement in the transparency leads to fair tendering competition between the contractor. Moreover, the reviewed literature about E-tendering stated that it enhances the organization transparency and anti-corruption movement leading to honest and fair tendering process between contractors or suppliers.
- 5) In summary we can say that the following advantages will be achieved by implementing the improved version of E-tendering:
 - a) Elimination of the redundant and time-wasting steps in the current traditional tendering phase, hence reducing its duration to the minimum.
 - b) Optimizing of the evaluation of tender bids and selection process of the winning tenderer.
 - c) Optimizing of the fairness, transparency and anticorruption standards in the tendering process.
 - d) Enhancing the efficiency of the organization due to improvements in the tendering process will enable the employees working in tendering departments to: 1-have more focus while running a tender, 2-produce more tenders than before, 3-to have more time to spend on improving the system.
 - e) Reduction in dependency on hard copies and paper work, leading to a better and easy archiving process that will enable the users of the tendering system to access historical tender documents easily. Such reduction will have a huge impact on saving the environment as well.
 - f) Enhancing the traceability through tendering by systemizing the tendering process, such enhancement will allow the management to have better control on the

process. Moreover, enhancement of traceability will greatly minimize the attempt of corruption.

- g) Simplification of tender publication process which will reflect positively on the tendering process duration.
- h) Minimization of human error involved in the tendering process as the process will be almost fully systemized. The advantage is specially achieved on a big scale in our research as our proposed improved version of E-tendering fully systemized the evaluation stage which involves a big amount of data tabulation and calculations, leading to a great reduction in human error probability.
- i) Cost savings from the tendering process cost, resulted from the enhancements caused by adopting E-tendering as described in the literature review.

6.2 Recommendation

Taking in consideration all the result analysis and conclusions displayed earlier, the following recommendations are drawn as follows:

- 1) It is recommended to adopt the improved version of E-tendering in the company as it will solve all the issues and challenges the company is facing during practicing the traditional tendering. Moreover, by adopting the improved version of E-tendering, the company can cut lose the redundant and time-wasting steps which will optimize the tendering process duration.
- 2) It's highly recommended for any organization to adopt the improved version of E-tendering in order to benefit from the process advantages such as, enhancing the organization tendering process efficiency, reducing paper work and dependency on hard copies, enhancing the company archiving system and traceability through the tendering process, simplifying the tender publication process, optimizing the organization transparency and anti-corruption standards and lastly minimizing the human errors involved in the tendering process.
- 3) Adopting the improved version of E-tendering is also recommended for the unique benefit provided by the systemized evaluation stage. Such benefit will hugely optimize the duration of the evaluation stage leading to faster and error free evaluation result.

7. Recommendations for Future Studies

During the research, some areas that require further studying were found and future recommended studies to support the findings of this research are suggested to bridge the gaps that were encountered during this research as listed below:

- 1) The targeted population for similar research should be extended to cover more individuals. Such extension will help in achieving higher accuracy for the questionnaire answers and in understanding the statistical difference found between the means in some indicators. Moreover, expanding the population will help us to find the existence of influence from the individual position on his opinion about corruption reduction by adopting E-tendering.
- 2) Additional and more specific questions are to be asked during the questionnaire survey to have better understanding of the population opinion about

traditional tendering and E-tendering and to be able to draft an estimated model for how actually E-tendering affect the tendering process with regards of time and cost.

- 3) A case study is to be taking place during the research where the researcher will implement the improved version of E-tendering on actual real-life tenders and check the result of the process to support the advantages claimed for adopting the improved version of E-tendering.

References

- [1] Adedeji, A., Owolabi, D., Ojelabi, R., Oyeyipo, O. and Damilola, A., (2017). Development of a web-based tendering protocol for procurement of construction works in a tertiary institution. *Journal of Theoretical and Applied Information Technology*, 95, pp.1595-1606.
- [2] Ajam, M., Alshawi, M. and Mezher, T., (2010). Augmented process model for e-tendering: Towards integrating object models with document management systems. *Automation in Construction*, 19 (6), pp.762-778.
- [3] Altoryman, A., (2014). Identification and assessment of risk factors affecting construction projects in the Gulf region: Kuwait and Bahrain (Doctoral dissertation). The University of Manchester, Manchester, UK.
- [4] Ayoti, B., (2012). Factors influencing effectiveness in tendering process in public sector, the case of Nyeri County Kenya. University of Nairobi, Kenya, pp.1-88.
- [5] Betts, M., Black, P., Christensen, S., et al. (2006). Towards secure and legal e-tendering. *Journal of Information Technology in Construction*, Vol.11. pp.89-102.
- [6] Casady, C., Flannery, D., Geddes, R., Palcic, D. and Reeves, E., (2019). Understanding PPP Tendering Periods in Canada: A Duration Analysis. *Public Performance & Management Review*, 42 (6), pp.1259-1278.
- [7] Chee H. Wong, Gary D. Holt & Patricia A. Cooper, (2000). Lowest price or value? Investigation of UK construction clients' tender selection process. *Construction Management and Economics*, 18: 7, 767-774.
- [8] Creswell, J., (2014). *Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research*, 4th ed. Edinburgh Gate, Harlow, Essex CM20 2JE: Pearson Education.
- [9] Cronin C., (2014). Using case study research as a rigorous form of inquiry. *Nurse Researcher*, 21 (5), pp.19-27.
- [10] Eadie R., Perera S., Heaney G. and Carlisle J., (2007) Drivers and barriers to public sector e-procurement within Northern Ireland's construction industry. *Electronic Journal of Information Technology in Construction*, Vol.12, pp.103-120.
- [11] Fellows R. and Liu A., (2015). *Research Methods for Construction*, 4th Edition. [online] Wiley. com. Available at: <<https://www.wiley.com/en-us/Research+Methods+for+Construction%2C+4th+Edition-p-9781118915745>> [Accessed 2 February 2021].

- [12] Friedman, L., (1956). A Competitive-Bidding Strategy. *Operations Research*, 4 (1), pp.104-112.
- [13] Fukui H. and Kobayashi K. (2010). Optimal comprehensive tendering models for project procurement. 2010 IEEE International Conference on Systems, Man and Cybernetics. pp.3258-3264.
- [14] Gunduz, M., Nielsen, Y. and Ozdemir, M. (2012). Quantification of delay factors using the relative importance index method for construction projects in Turkey. *Journal of management in engineering*, 29 (2), 133-139.
- [15] Hayes, L., Sourani, A. and Sertyesilisik, B., (2016). An investigation into the improvement of tendering processes and the level of competition for PFI CONSTRUCTION PROJECTS. MODERN PROJECT MANAGEMENT, pp.94-103.
- [16] Ivankova N., Creswell J. and Stick S., (2006). Using Mixed-Methods Sequential Explanatory Design: From Theory to Practice. *Field Methods*, 18 (1), pp.3-20.
- [17] Kajewski, S., Tilley, P., Crawford, J. et al. (2001), Electronic tendering: an industry perspective. technical report, Queensland University of Technology, Brisbane, 76pp.
- [18] Kajewski, S. and Weippert, A. (2004). E-Tendering: Benefits, Challengers and Recommendations for Practice. CRCCI International Conference: Clients Driving innovation, Surfers Paradise, Australia.
- [19] Lavelle, D. and Bardon, A. (2009). E-Tendering in construction: time for a change?. *Northumbria Working Paper Series: Interdisciplinary Studies in the Built and Virtual Environment*, 2 (2), pp.104-112.
- [20] Lindsley, G. and Stephenson, P. (2008). E-Tendering process within construction: A UK perspective. *Tsinghua Science and Technology*, 13 (S1), pp.273-278.
- [21] Lou, ECW and Alshawi, M., (2009). Critical success factors for e-tendering implementation in construction collaborative environment: people and process issues. *Journal of Information Technology in Construction*, 14, pp.98-109.
- [22] Manikandan S., (2011). Measures of central tendency: Median and mode. *Journal of Pharmacology and Pharmacotherapeutics*, 2 (3), p.214.
- [23] Mukelas M. and Zawawi E. (2012). Theoretical framework for ICT implementation in the Malaysian construction industry: Issues and challenges. 2012 International Conference on Innovation Management and Technology Research. pp.275-279.
- [24] Nathan, R. (2019). What is tendering?. [online] Info. [australiantenders.com.au](https://info.australiantenders.com.au/blog/what-is-tendering). Available at: <https://info.australiantenders.com.au/blog/what-is-tendering> [Accessed 14 Jun.2019].
- [25] Nawi, M., Roslan, S., Salleh, N., Zulhumadi, F. and Harun, A., (2016). The Benefits and Challenges of E-procurement Implementation: A Case Study of Malaysian Company. *International Journal of Economics and Financial Issues*, 2016, Vol 6, pp.329-332.
- [26] Nesan Lenin, J. (2011). Integrated E-Bidding Framework for Construction. *International Journal of Construction Education and Research*, 7 (4), pp.243-258.
- [27] Neupane, A., Soar, J. and Vaidya, K., (2012). Perceived Benefits Related to Anti-Corruption from e-Tendering System in Nepal. *Asian Journal of Information Technology*, 11 (1), pp.22-29.
- [28] Patil T., and Waghmare, A., (2014). Tender and Bidding in Construction Projects. *Journal of Engineering Research and Applications*, Vol.4, Issue 12 (Part 5), pp.18-22.
- [29] Patrick, Z., (2006). Strategies for Minimizing Corruption in the Construction Industry in China. *Journal of Construction in Developing Countries*, 11, pp.15-29.
- [30] Price J. and Murnan, J., (2004). Research Limitations and the Necessity of Reporting Them. *American Journal of Health Education*, 35 (2), pp.66-67.
- [31] Rimmer, S., (1998). Competitive Tendering and Outsourcing — Initiatives and Methods. *Australian Journal of Public Administration*, 57 (4), pp.75-84.
- [32] Sayed A., Assaf S., Aldosary A., Hassanain M. and Abdallah A., (2019). Drivers of e-bidding implementation in the Saudi Arabian construction industry. *Built Environment Project and Asset Management*, 10 (1), pp.16-27.
- [33] Sayers, P., (1997). *Competitive Tendering: Management and Reality, Achieving Value for Money*. Taylor & Francis.
- [34] Sofia Lundberg, Mats A. and Bergman, (2017). Tendering design when price and quality is uncertain. *International Journal of Public Sector Management*, Vol.30 Issue: 4, pp.310-327.
- [35] Tindsley, G. and Stephenson, P., (2008). E-tendering Process Within Construction: A UK Perspective. *Tsinghua Science and Technology*, 13 (S1), pp.273-278.
- [36] Ugochukwu, S. and Okolie, K., (2013). Investigation into The Factors Influencing Tendering Duration Stipulations by Public Building Clients In Nigeria. *IOSR Journal of Engineering*, 3 (10), pp.15-21.
- [37] West, R., Hore, A. and O'Connell, L., 2009. Electronic Tendering: Delivering Business Efficiencies for the Irish Construction Industry. *International Conference on Information Technology in Construction*.
- [38] Woodhams, J., (2001). *Successful competitive tendering*, London: Hawksmere.
- [39] Yahya, M. and Panuwatwanich, K., (2018). Implementing e-tendering to improve the efficiency of public construction contract in Saudi Arabia. *International Journal of Procurement Management*, 11 (3), p.267.
- [40] YANG, F. and SONG, Z., (2010). Research on Optimization of Tender Project Process Based on Theory of Project Management. 2010 IEEE International Conference on Advanced Management Science, pp.291-294.