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Contractors' Actual Contribution During Projects' Implementation: Jordanian Construction Sector

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ABSTRACT

Many problems of construction industry are related to contractors. A question about how they actually deal with the awarded projects is raised in this paper. It aims at investigating the level of the contractors' contribution by their own facilities to works' execution, use of equipment, and project management, as the main fields of their responsibility for projects' implementation. Results show that dependence on others in all main responsibilities is higher than the acceptable levels. According to the contractor's grade and specialty, a higher level of dependence has been observed in using equipment with lower significant differences, while project management and works' execution show lower levels of dependence with higher significant differences in contribution percentages. It has been mentioned, that this situation appears for seeking low priced approaches for project implementation as a result of the current bidding system. The high level of dependence on others is expected to be a suitable atmosphere for the contractors' problems with the projects' implementation. There is a need for decreasing the level of dependence, as one of the approaches for competition and successful project implementation.

KEYWORDS: Jordanian contractors; construction management; project implementation; contractor's contribution; contractor's responsibilities.

INTRODUCTION

Construction industry is one of the largest production activities in Jordan. It occupies a fundamental position in the national economy. As well as in the most developing countries, this sector requires many efforts to face many problems, related to the contracting system and construction project implementation. As one of the main problems, the construction sector must be adequately prepared in the field of project management to cope with the increasing development and complexity of construction projects and activities.

The problems of delays, increasing cost, poor quality, are usually raised. Unfortunately, among all the participants in the construction industry, the contractor appears as one of the main factors, causing these problems. First of all, there is a need to understand the atmosphere of the Jordanian contractor's work, the conditions and the actual way of dealing with his responsibilities. Because of that, a question about the contractor's actual contribution in the main fields of his responsibility is raised in this paper. It aims at investigating the levels of the contractors' contribution by their own facilities to works' execution, use of equipment, and project management, as the main fields of their responsibility for the projects' implementation. This will be studied according to the contractors' formal classification by grades and specialty in order to find any significant differences in their contribution. Contractors of first, second and third grades, specialized in buildings, roads, and other specialties (electromechanical works, sewage and water, etc…) are addressed in this paper.

Background and Literature Review:

The implementation of construction projects is facing many serious problems in the construction industry sector of Jordan. The results of these problems usually appear in terms of time, cost and quality (Jordanian Contracting

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Sector Development Symposium, 1996).

Many requirements concerning contractors' licensing, registration, classification and responsibilities for project implementation are included in the Law of Public Works (1986), the Construction Contractors Law (1987) and the Regulations for Contractors' Classification (2000). These laws allow them, without limitations, to subcontract with others in any related field for project implementation, even with contractors with lower grades in the same specialty.

At the same time, they include a serious attention in respect to quality, time and cost, which are generally known as the main criteria of the successful execution of construction projects. On the other hand, the Jordanian contractor is dealing with an awarding strategy, which allows the contract to be awarded to the lowest bidder for the majority of public works. In its annual report (1999), the Jordanian Construction Contractors Association has criticized the awarding system as a cause of delay and poor quality.

Many efforts of researchers aim at finding and examining the factors or reasons of unsuccessful project implementation according to the criteria of time, cost and quality. The interesting ones for the purpose of this paper are those, which are pointed to the contractor's responsibilities through the project implementation. The contractor's responsibilities have been mentioned in many studies and efforts concerning the causes of delay and increasing costs. The categories of delay in construction projects are determined by Yates (1993), where responsibilities like equipment, management and subcontractors are included as categories. In Ogunlana and Promkuntong (1996), one of the three layers of the construction industry problems is represented by the problems caused by incompetence of contractors. The poor contract management is determined as one of the most important factors of delay and cost overrun in Mansfield (1994). Assaf, Al-Khalil and Al-Hazmi (1995) found that some of the most important causes are the conflicts in work schedules of subcontractors, slow decision making and inadequate labor skills. Among the highly ranked factors of delay are the inadequate contractor experience, labor productivity, site management, slow decision making, construction methods, improper planning and subcontracting, labor and equipment , see (Odeh and Battaineh, 2002). The contractors are advised by Xiao and Proverbs (2003) to focus on maintaining stable workforce and establishing partnerships with their subcontractors to improve their overall performance.

All the discussed conclusions, related to problems of the management of construction industry focus on the contractor as one of the main reasons. However, it can be misleading for many reasons. Firstly, the authors didn't take into account the ability of contractors to meet their main responsibilities. Secondly, most of the analyses did not cover the causes for which the contractor is responsible, mainly in the fields of management, technology and implementation. Thirdly, no attention had been paid to the contractor's self-evaluation. It should be expected that, the viewpoint of clients and consulting engineers could play a serious role in the ranking of causes concerning the contractors. Fourthly, the authors conducted their studies considering all contractors as one group, regardless their classification by grades and specialties.

It is understood, that working with construction projects requires the efforts of many dealers in all the stages of implementation. Besides the client and the consultant engineer, the construction contractor needs other external efforts, which should be limited to: supply, transportation, rental of special machines and equipment, and executing special or unique works. But it is not understood that the contractor increases his dependence by subcontracting with others in the fields of his main responsibility like rental of standard machines and equipment, management firms and offices, teams and other contractors.

There is a need to explore the contractor's actual contribution level within his responsibility for the project implementation.

The main responsibilities to be carried out by the contractor's own organization include: hiring teams specialized in his specialty field for work execution, owning the needed standard machines and equipment, and managing the project. They are briefly determined below:

- **Works' Execution:** those fields of construction works which are expected to meet the specialty of the main contractor, and must be implemented by his own forces. But the contractor engages work teams in line with his specialty, according to which he had been registered and classified and on the basis on which he was awarded the bidding. Sometimes, he subcontracts even with lower-graded contractors in the same specialty.
- **Equipment:** The standard equipment (widely and

multiple used machines and equipment), which must be at least owned by the contractor. But leasing equipment, even standard equipment, is widely used as it can improve a contractor's working capital position by avoiding having his funds tied up in fixed assets (Grant, Ireson and Leaverton, 1990).

- Project Management: To organize and manage the whole project using the modern approaches and tools of planning, scheduling and control of project operations (Burke, 2003; Meredith, 1995; Harris, 1997).

Data Collection and Analysis

In order to analyze the main contractor's contribution in the awarded projects, a questionnaire was generated to measure the percentages of his dependence on others in the fields of executing the main works, equipment, and management. Some personal interviews with top administrative levels in many firms have facilitated the preparing and constructing process of the questionnaire.

The strategy followed during the preparation of the questionnaire took into account avoiding any questions that might be misinterpreted, reducing the number of questions, addressing the questions in a simple and direct Arabic language, sorting the questions in a logical manner, and expressing most of the questions in such a form that makes the answers definite.

The questionnaire has been designed to cover the following three parts:

The first one includes general information to identify the contractor in terms of his grade and specialty. The second part (the main one) is to give the average percentages of dependence of the contractor in each of the mentioned three responsibilities, using the experience of not less than three implemented projects. The third part is open and depends on the contractor's willingness and initiatives. The contractor has been asked to give his evaluation, expressed in percent, about the level of dependence to be considered as high (not acceptable), and to give at least one main reason of depending on others in each of these three responsibilities.

The population of the study is the officially registered and classified Jordanian Contractors of first, second and third grades. Selecting such a population can help to guarantee a high level of trust, extensiveness and confidence of the received data. The contractors in these grades are almost of stable abilities, have good documentation tools and are usually called for tender to implement public and large private projects. This population consists of 393 contractors. 139 of them are classified in the first, 94 in the second and 160 in the third grade (A special issue of *Al-Bina'*, 2000).

Using stratified random sampling, a sample of 150 contractors (about 38% of the population) have been targeted. In the proportion of the total number, this sample included 55, 40, and 55 contractors in the first, second and third grades, respectively.

The questionnaire was pilot- tested and revised. After that, the selected 150 contractors' firms were approached, and their representatives (at least the main engineer in the firm) were met and asked to fill out the questionnaire. This direct personal interview approach was resorted to in order to ensure that the firm representative expresses the firm's opinion, to avoid any misinterpretation of the questions, and to increase the rate of response. A total of 135 contractors replied (with response rate of 90%). Some firms refused to fill the questionnaire at all, due to their policy of not giving information. Others, especially contractors of the third grade did not fill it due to their poor documentation, weak data base and/or unstable facilities. Table (1) shows the details.

All the items concerning the first and second parts of the questionnaire have been filled out by all the respondents. All the received data have been taken into consideration. Relevant descriptive analyses were conducted on the received data (Table 2). This table shows that the highest level of the contractors' dependence is related to the use of equipment. Main contractors rent 38.4% of the standard machines and equipment for project implementation.

Table (3) summarizes the distribution of contractors by grade and specialization.

The collected data is stratified to show the average percentages of budget allocated for equipment, management, and works' execution. Contribution percentages are stratified according to grade and specialty of the contractors. Each (3 X 3) contingency tables (4, 5, and 6) is tested using Chi-square to test if there are any significant differences in contribution percentages based on grade and/or specialization of the contractors.

The expected value for each group is calculated and tabulated in Tables (7, 8, and 9) for equipment, management, and works' execution, respectively. Then, the Chi-square value is calculated and compared to the critical Chi-square value (15.51) at a confidence level of 95%.

The results, as summarized in Table (10), show that

there are significant differences in contribution percentages based on grade and specialization of the contractors for the fields of equipment, management, and implementation. However, equipment shows the smallest significant differences across groups; whereas management and implementation show higher significant differences across groups.

As there are no norms found by the author, according to which the actual levels of dependence may be evaluated and compared, a question about the acceptable level of dependence has been raised in the third part of the questionnaire to be suggested by the contractors themselves. Unfortunately, only 72% of the sample members have given full comments. Nevertheless, it is interesting to mention their evaluations in general. The received data show that, regardless their grade and specialty, this group of Jordanian contractors decided that, the average percent of the highest acceptable dependence level is 20% in using standard equipment, 20% in the field of project management, and 25% in the works' execution. Comparing the actual averages with these levels, it is almost fair to say that the Jordanian contractors exceeded the mentioned acceptable levels of dependence in all their main responsibilities.

Concerning the reasons of the high level of dependence, most of them (85%) pointed that the Jordanian contractor is dealing with an awarding strategy based on General Contract Method, which allows the contract to be awarded to the lowest bidder for the majority of public works (Hinze, 2001). Such conditions of the contracting practice may push the contractors to seek low - priced approaches for project implementation. The simplest approach is to subcontract with others for the jobs needed for project implementation, including the jobs of the contractor's main specialty.

Furthermore, the limited number of awarded projects makes hiring specialized teams on a fixed basis not reasonable and not profitable. On the other hand, most of these teams are not Jordanian workers, which means low daily salary with no need for medical and social insurance. Concerning the machines and equipment, the very high ownership cost is figured as a common reason. This reason is mentioned by 97% of the contractors.

Dealing with specialized construction management firms is mentioned to be more suitable for contractors. Establishing a construction management unit in the firm needs specialists, special teams and equipment. It needs continuous development. It costs more. This reason was figured by 61% of the contractors. On the other hand, many of the owners and consultant engineers prefer a specialized firm to establish the schedules and plans for the projects. Such a reason was mentioned by 22% of the contractors. It is important to mention here that seeking a cheap help for some managerial questions from specialized project management firms, does not mean that the solution takes all the unique elements of the particular firm for the particular project into consideration.

Conclusions

The Jordanian contractor is figured as one of the important factors of many problems of the construction industry, especially in project implementation. Questions about how he is dealing with the awarded projects are raised in this paper. It aims at investigating the levels of the contractors' contribution by their own facilities to works' execution, use of equipment, and project management, as the main fields of their responsibility for the project's implementation.

A questionnaire has been designed and administered to a sample of 150 contractors. The collected data from 135 respondents have been analyzed.

A higher than acceptable level of dependence on others is found in all main fields of the contractors' responsibilities.

Significant differences have been found in the contribution percentages based on grade and specialization of the contractors for using standard machines and equipment, project management, and works' execution. However, equipment shows the smallest significant differences across groups; whereas management and construction works implementation show higher significant differences across groups.

All the reasons of dependence are explained in terms of lower priced contributions. The contracting system, according to which the contract is awarded to the lowest bidder is pushing the contractor to seek low- priced approaches for project implementation. Subcontracting with lower-graded contractors, with management firms, and with equipment owners may lead to low cost, but also to the main reasons of construction management problems. The low contribution of the main contractor may lead to weak linkage, weak organization and weak execution, then to more problems with quality, cost and time which are generally known as the main criteria of the successful execution of construction projects.

It is important to recommend to decrease the level of dependence on others in the contractor's main responsibilities by using other contracting methods and enhancing contractors' cooperations.

The results may be taken into consideration when studying the construction management problems, related with contractors and projects' implementation. Further studies should be conducted to investigate more construction sector problems.

Table 1. The response profile of the contractors.

	Classification by grade			
	Sum	Grade 1	Grade 2	Grade 3
Population	393	139	94	160
Sent	150	55	40	55
Sample rate	38%	40%	42%	34%
Received	135	55	36	44
Rate of response	90%	100%	90%	80%

Table 2: Data descriptive analyses of contractors' contributions (%).

	Equipment	**Management**	**Work execution**
Average %	38.4%	23.5%	36.5%
St. dev.	19.2	20.31	19.81
Confidence	4.95	7.81	4.96

Table 3: Contractors' classification by grade and specialization.

Grade\Specialization	**b**	**r**	**o**	**Total**
1	35	7	13	55
2	22	9	5	36
3	29	8	7	44
Total	86	24	25	135

(b-buildings; r- roads and highways; o- other works).

Table 4: Average contractors' contribution (%) for equipment.

Grade / Specialization	**b**	**r**	**o**
1	40.6	28.9	39.4
2	43.8	26.1	42.7
3	51.2	54.3	49.5

Table 5: Average contractors' contribution (%) for management.

Grade/Specialization	b	r	o
1	18.7	8.1	7.2
2	31.9	33.7	48.6
3	27.3	29.4	15.4

Table 6: Average contractors' contribution (%) for work execution.

Grade/Specialization	b	r	e
1	26.9	29.4	9.3
2	61.4	21.4	33.1
3	30.4	25.3	42.6

Table 7: Average contractors' contribution (%) for equipment (expected).

Grade/Specialization	b	r	o
1	42.3	35	32.1
2	45.1	32.4	40.3
3	50.9	40.3	43.7

Table 8: Average contractors' contribution (%) for management (expected).

Grade/Specialization	b	r	o
1	19.4	20.6	21.6
2	32	35.4	28
3	25.4	27.6	18.1

Table 9: Average contractors' contribution (%) for work execution (expected).

Grade/Specialization	b	r	o
1	31.4	22.4	25.7
2	32.5	18.5	24.1
3	46.1	34.1	32.6

Table 10: Chi-square values for contractors' contribution (%).

Contribution %	Chi-square value
Equipment	21.51
Management	77.94
Work execution	71.6

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مستوى مساهمة المقاول في تنفيذ المشاريع المحالة: قطاع الإنشاءات الأردني

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ملخـص

تتعدد أسباب المشاكل المرتبطة بالتزام المقاولين بمسؤولياتهم الرئيسية في الصناعة الإنشائية، مما يثير التساؤل حول كيفية تعامل المقاول فعليا مع المشاريع المحالة عليه. لذا، فقد هدفت هذه الورقة إلى التحري عن المستوى الفعلي لمساهمة المقاولين الرئيسيين باستخدام إمكانياتهم الذاتية في تنفيذ المهام الرئيسية المنوطة بهم في أثناء تنفيذ المشاريع المحالة عليهم، والتي منها إنجاز النشاطات، وامتلاك واستخدام المعدات الإنشائية وإدارة المشروع. لقد تبين أن نسبة اعتماد المقاول على الغير في تنفيذ كل مهامه الرئيسية تفوق الحد المقبول. وباعتماد درجة تصنيف المقاول وتخصصه، فقد لوحظ ارتفاع في مستوى اعتماد المقاول على الغير في استخدام المعدات الإنشائية مع فروقات ذات أهمية منخفضة، في حين لوحظت فروقات ذات أهمية أعلى فيما يتعلق بتنفيذ الأعمال وإدارة المشروع. لقد أشير إلى أن هذا الوضع يظهر نتيجة البحث عن مداخل ذات كلفة متدنية لتنفيذ المشروع وكنتيجة للسياسة الحالية في إحالة العطاءات.

ويتوقع أن يؤدي ارتفاع مستوى الاعتمادية على الغير في تنفيذ المهام الرئيسية المنوطة بالمقاولين إلى تشكيل بيئة مناسبة لمشكلات المقاول في تنفيذ المشاريع. وهناك حاجة إلى تقليل مستويات الاعتمادية كأحد المداخل الرئيسية للتنافس والتنفيذ الناجح للمشروعات.

الكلمات الدالة: المقاولون الأردنيون، إدارة مشاريع الإنشاءات؛ إحالة عطاءات المشاريع؛ مساهمة المقاول؛ المسؤوليات الرئيسية للمقاول.

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