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Major causes of problems between contractors and subcontractors in the Gaza Strip

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Abstract

Purpose – Subcontractors play a significant role in the Palestinian construction industry as about 90 per cent of the work is performed by subcontractors. The main objective of this paper is to identify and analyse the major problems which exist between the contractors and subcontractors in the construction industry in the Gaza Strip.

Design/methodology/approach – A questionnaire was designed to elicit contractors' and subcontractors' viewpoints regarding the most important causes of problems that affect the relationship between them. A total of 53 problems were identified based on a literature review, a pilot study was considered in this study and was listed under five groups. A total of 150 questionnaires were randomly sent to contractors and subcontractors. The respondents had extensive experience in the construction industry with average working experience of 20 years. The questionnaire was validated by the criterion-related reliability test that measures the correlation coefficients between the factors selected for in each group and for all groups as one entity, and structure validity test (Spearman test).

Findings – The result of the survey indicated that, assigning part of the works to new subcontractor without informing the original subcontractor, contractor's financial problems, delay in contract progress payments, non-adherence to the conditions of the contract, non-adherence of the subcontractor to the time schedule, and lack of construction quality work were the most important causes of interface problems, while involvement in several projects with the contractor at the same time, weather conditions, and geological problems on site were considered as trivial causes of potential interface problems. Spearman's rank correlation tests showed that there are no differences in the viewpoints between contractors and subcontractors.

Originality/value – The research findings might assist practitioners to focus on major problems which have existed between the contractors and subcontractors in the construction industry in their present and future projects. By eliminating or minimizing these problems, subcontractors are encouraged to contribute significantly to the capital risk, resources, managerial effort, and business expertise supporting the largest industry in Palestine. The paper would be valuable for all academics and industry professionals involved in construction business in general.

Keywords Contractors, Subcontractors, Construction industry, Contract problems, Palestine, Subcontracting

Paper type Research paper



Introduction

The construction sector is one of the key economic sectors and is the main force motivating the Palestinian National Economy. Upon the establishment of the Palestinian National Authority and the assumption of its powers over the Palestinian territories in 1994, the construction sector has witnessed noticeable expansion and activities. This has resulted in the recovery of the construction contracting profession and subsidiary industries, encouraged the investment of the Palestinian expatriates' capital in the local construction sector, and contributed to the creation of jobs for thousands of Palestinians. Therefore, the construction sector has occupied the foremost position among the rest of sectors, mainly in the attraction of investments and creation of new jobs (Palestinian Contractors Union (PCU), 2008). The construction industry in Gaza Strip is dominated by a competitive business environment that is being driven by a lowest cost award system. The pressure on contractors bidding decisions has further increased in the last five years due to the current political situation, which causes a sharp decrease in the number of the available projects.

Strain in the relationships between the main contractor and subcontractor may develop due to poor communication, lack of information on site, poor supervision, master and slave syndrome, and lack of management systems. Inevitably, this will lead to poor overall management of the projects, poor quality products, late project delivery and create dissatisfaction between the main contractor and subcontractor as well as clients (Othman, 2007). Hinze and Tracy (1994) reported that, not all subcontractors have the same perception of the main contractor-subcontractor relationship. In some instances the relationship borders on being a partnership or team arrangement while for others the relationship is more adversarial in nature with a greater amount of distrust and lack of communication. Many subcontracts are awarded without any formal discussion taking place between the main contractor and the subcontractor. This may increase the probability of conflicts after construction work has begun. The aim of this paper is to identify and rank problems that exist between contractors and subcontractors in the construction industry in Gaza Strip according to their relative importance index (RII). The findings of this research could help both contractors and subcontractors to gain better understanding of the problems in order to resolve or reduce them as early as possible. This will reduce disputes, time and cost overruns and eventually, contribute positively to the improvement of the construction industry in Palestine.

Problems between contractors and subcontractors

Moore *et al.* (1992) stated that a construction project involves many parties, such as owners, designers, construction main contractors, subcontractors, maintenance contractors, and material suppliers. Some problems may arise, for example, the lack of cooperation, limited trust, and ineffective communication leading to an adversarial relationship among all these project stakeholders. Adverse relationship may induce project delays, difficulty in resolving claims, cost overruns, litigations, and compromise project quality. Al-Hammad (1993) revealed that the lack of construction work quality, scheduling conflicts, change orders, delay in progress payments were common problems that adversely affect execution and completion of construction projects.

Fah (2006) suggested that, before any action is taken in problem solving, the factors and reasons of the problems must be identified. Huang *et al.* (2008) suggested that earlier

solutions to problems can efficiently lower wastage with regard to cost and time. These problems need to be immediately and carefully resolved, particularly through proper coordination, cooperation, and communication among the construction parties. Main contractor must thoroughly plan his work and that of his subcontractors as much as possible during the bidding process. The prospective subcontractor should fully understand the scope of work, and he should be aware of the construction methods, equipment, and sequence of operations the general contractor proposes to use; and the schedule features most affecting the sub's performance (Proctor, 1996). Disputes may be avoided, and time saved in negotiating subcontracts, if subcontractors are made aware at the time of preparing their proposals of all the conditions under which they will work during project execution. In order to coordinate effectively a sub's work with that of other subcontractors the main contractor must know each sub's work in detail. Hinze and Tracy (1994) recommended that the subcontractor should furnish sufficient forces to assure proper performance of its agreement in strict compliance with all performance schedules. The subcontractor shall increase his work force; accelerate his performance, work overtime and work on holidays, all without additional compensation.

Maintaining high quality relationships with subcontractors enables a general contractor to address coordination problems in construction processes by capturing the benefits of inter-organizational learning (Khle and Arditi, 2001). A balanced flow of information between main contractors and subcontractors is necessary for a smooth execution of project activities (Othman, 2007). PCICB (2003) recommended that subcontracts should facilitate the prevention and early resolution of disputes. Apart from arbitration, alternative arrangements such as mediation, adjudication and dispute resolution boards may also be considered. Proctor (1996) suggested that disputes could be avoided through better understanding between the involved parties of the scope of their responsibilities and obligations, as well as guidelines that promote a general expectation of fairness. Also, they suggested that many disputes could be avoided if each party tried, during contract negotiation and execution, to treat the other as they would want to be treated, were the positions reversed.

Contractors and subcontractors should work out an arrangement to facilitate coordinated and proactive problem solving. In this context, regular meetings to review progress and joint site inspections to check the quality of completed works, work in progress and safety compliance may be considered (PCICB, 2003). The contractor must often serve as a mediator between subcontractors. Weekly meetings called by the main contractor for the subcontractors currently or imminently involved in the project are an extremely important coordination tool. Daily contact of the main contractor's superintendent with each subcontractor is also essential if the main contractor's superintendent is to keep abreast of operations, problems, and schedule compliance. This also aids in anticipating conflicts that may be developing between two or more subcontractors whose work interrelates (Proctor, 1996). The contracting parties should maintain a cooperative spirit built upon ethical behavior and fair dealings. Contractors may also develop long-term strategic relationship with subcontractors enjoying a good reputation. The contracting parties may adopt partnering arrangements to facilitate setting of common objectives, to improve communication, and to expedite dispute resolution (PCICB, 2003).

Contractors should provide active support to their subcontractors in order to elevate their performance through:

- regular performance evaluation and appraisals;
- post-completion reviews; and
- training for the managerial and supervisory staff and workmen.

On the other hand, contractors may impose sanctions against subcontractors with poor performance through measures such as suspension from tendering or removal from approved lists (PCICB, 2003). Proctor (1996) suggested that the contractor must closely monitor the daily activities of each subcontractor and point out any evidence of slippage in schedule or performance. In addition, they can frequently assist the subcontractor in guidance and advice on optimization of manpower in order to meet project schedule. The more detailed the effort on the part of the main contractor in planning each phase of the project and particularly the specific operations of each subcontractor the more likely it is the overall schedule will be realized (Huang *et al.*, 2008) concluded that the first step to solve interface problems was to train employees, increase their coherence, and create an atmosphere of cooperation. Payment policies of the main contractor should be stipulated in advance to prospective subcontractors. Progress payments should be made as soon as the main contractor receives payment for that portion of a completed contract. The main contractor should withhold as retention from the subcontractor's billings no larger percentage than is withheld from the main contractor's billing. Release of retention should be made as soon as it is obtained by the main contractor (Proctor, 1996).

Methodology

In this research, questionnaire survey (a quantitative approach) was used to collect the factual, perceptible, and attitudes of the respondents (Fellows and Liu, 1997; Israel, 2003). Two populations were targeted in this research. The first population comprised contractors that are operating in the Gaza Strip; they are general building contractors registered with PCU and are classified under the building category (i.e. housing, hospitals, and schools) in the Gaza Strip. These categories are "first, second, and third", with valid registration. The small categories (fourth and fifth) were not considered due to the low practical and administrative experience of their companies in construction works and the low experience of their subcontractors. Based on the list of registered contractors at the PCU in December 2008, the size of population for the first, second, third, building categories was 144 companies.

The second population included was the subcontractors in the various types of work fields like shuttering, brick laying, plastering, tiling, painting, mechanical, electrical, aluminium, carpentry, and ironmongery. Unfortunately, there are no official reports showing the exact number of subcontractors in Gaza, since they are not represented by any union or association. However, after discussion with some main contractors from different classification categories about the number of their subcontractors, the number of subcontractors was roughly estimated to be 250.

To determine the sample size for each population of contractors and subcontractors, Kish (1965) equation was used:

$$n = \frac{n'}{1 + (n'/N)}$$

n' is the sample size from infinite population, which can be calculated from this formula ($n' = S^2/V^2$). The definitions of all variable can be defined as the following:

- n sample size from finite population.
- N total population (144 contractors and 250 subcontractors).
- V standard error of sample population equal 0.05 for the confidence level 95 percent, $t = 1.96$.
- S^2 standard error variance of population elements, $S^2 = P(1-P)$; maximum at $P = 0.5$.

The sample size for the contractors' and subcontractors' population can be calculated from the previous equations as follows:

$$n' = \frac{S^2}{V^2} = \frac{(0.5)^2}{(0.05)^2} = 100$$

$$n_{\text{contractors}} = \frac{100}{1 + 100/144} = 59 \text{ contractors}$$

$$n_{\text{subcontractors}} = \frac{100}{1 + 100/250} = 71 \text{ subcontractors}$$

Although the calculated sample size for contractors is 59, the questionnaires were sent randomly to 70 contractors to overcome the risk of low response and to reflect higher reliability and benefits for the study. For the same reason, 80 questionnaires were sent randomly to subcontractors. Face-to-face deliveries of the questionnaires are used to promote respondents and raise response rate in addition to the personal contacts of the contractors. Therefore, the response rate was high 81 percent for contractors and 71 percent for subcontractors as shown in Table I. The respondents were experienced construction managers (with average experience 20 years in the construction industry). They are involved in building projects.

Moser and Kalton (1971) showed that a response rate of less than 30 percent is likely to produce results subject to non-response bias. Based on this, the obtained response rates of 81 and 71 percent are reasonable and would reflect reasonable results and outputs.

The study targeted the main contractors and subcontractors distributed all over the Gaza Strip as shown in Table II.

In total, 53 problems were identified based on a literature review and a pilot study was considered in this study and were listed under five groups (Enshassi *et al.*, 2008; Huang *et al.*, 2008; Ng *et al.*, 2008; Enshassi and Medoukh, 2007; Sambasivan and Soon, 2007; Alinaitwe *et al.*, 2007; Othman, 2007; Fah, 2006; Arditi and Chotibhongs, 2005; Kumaraswamy and Matthews, 2000; Proctor, 1996; Hinze and Tracy, 1994;

Table I.
Sample size and response rate of the study populations

Population category	Total population	Calculated sample size	Distributed questionnaire	Number of respondents	Response rate (%)
Contractors	144	59	70	57	81
Subcontractors	250	71	80	57	71

Al-Hammad, 1993; Moore *et al.*, 1992; Al-Hammad and Assaf, 1992; Al-Hazmi, 1987). The selected factors and their related groups are shown in Table III.

In order to fit into conditions in the Palestinian construction industry, a pilot study was performed for preliminary questionnaire. Ten experienced experts were involved in this pilot study. They are five contractors, two subcontractors and three consultants. All respondents were experienced industry professionals; with an average working experience in the construction industry of 25 years. The designations of the respondents were managing directors, general managers, and senior project managers. Therefore, it is expected that the data collected from them are reliable. The ten respondents were asked to critically review the design and structure of the questionnaire. Their valuable comments and suggestions were used to revise the questionnaire. All suggested comments and modifications were taken into consideration. Minor changes, modifications, and additions were accommodated based on pilot study findings to develop the final questionnaire. The questionnaire was validated by the criterion-related reliability test that measures the correlation coefficients between the factors selected for in each group and for all groups as one entity, and structure validity test (Spearman test). Cornbach's α coefficient of internal consistency reliability tests for level of frequency responses was also used.

The RII technique has been widely used in construction research for measuring attitudes with respect to surveyed variables. Several researches (Enshassi *et al.*, 2008; Alinaitwe *et al.*, 2007; Chung *et al.*, 2003) used the RII in their analysis. The respondents were asked to rate the identified interface problems on a five-point Likert scale (1 for the strongly disagree to 5 for the strongly agree). Based on the survey response, a RII was tabulated using the following equation:

$$\text{Relative Importance Index} = \frac{\sum w}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N}$$

where W is the weighting given to each factor by the respondent, ranging from 1 to 5 (n_1 = number of respondents for strongly disagree, n_2 = number of respondents for disagree, n_3 = number of respondents for neutral, n_4 = number of respondents for agree, and n_5 = number of respondents for strongly agree). "A" is the highest weight (i.e. 5 in the study) and N is the total number of samples. The RII ranges from 0 to 1.

Analysis of results

Causes of problems by general contractors

Table IV shows the responses about the factors affecting problems caused by contractors according to RII. As shown in Table IV, the assigning part of the works to new subcontractor, without informing the original subcontractor was ranked as the most important cause of problems by both the contractors and subcontractors with RII of (0.949). Also, each of them separately ranked this cause as the most important one with RII of (0.958) and (0.940), respectively. The results emphasize that, this is the most

Group	North	Gaza	Middle area	South	Total
Contractors	11	32	5	9	57
Subcontractors	12	35	6	4	57

Table II.
Geographical distribution
of the sample

Table III.
Causes of interface
problems

Causes retrieved from literature	Causes selected based on pilot study
<i>I. Factors caused by main contractors</i>	
Contractor's financial problems (Al-Hammad, 1993; Othman, 2002) Delay in contract progress payments (Al-Hammad, 1993; Al-Hazmi, 1987)	Selected Modified Main contractor's financial problems Delay in contract progress payments
Interruptions and termination of work (Proctor, 1996; Al-Hammad, 1993)	Selected Interruptions and termination of work by the contractor
Delay in shop drawings and sample material approval (Al-Hammad, 1993)	Selected Delay in shop drawings and sample material approval
Material resource (Othman, 2002)	Modified Delay by the main contractor in providing the necessary materials to the subcontractor
Lack of cooperation (Al-Hammad, 1993; Alinaitwe <i>et al.</i> , 2007)	Added Providing low-quality materials that result in low-quality workmanship
	Added Delay of the main contractor in submitting the formal documents to the supervision staff, which leads to delay in implementing the works
	Modified Failure to provide necessary clarifications of the drawings to the subcontractor
	Added Assigning part of the works to new subcontractor, without informing the original subcontractor
	Added Failure of the main contractor to use the insurance in case of injury of subcontractor's labour
	Added Failure to provide the subcontractor with essential services such as electricity, water, etc.
	Added Failure to provide proper security for the site and plant
Scheduling conflicts between the contractor and the subcontractor (Al-Hammad, 1993; Huang <i>et al.</i> , 2008; Proctor, 1996) Scheduling conflicts among the subcontractors (Al-Hammad, 1993; Huang <i>et al.</i> , 2008; Proctor, 1996) Lack of management systems (Othman, 2002; Proctor, 1996)	Added Using distant location for storage of materials
	Added Frequent absence of the main contractor from the site
	Added Involvement of the main contractor in several projects at the same time
	Selected Scheduling conflicts between the contractor and the subcontractor
Selected Scheduling conflicts among the subcontractors	Selected Scheduling conflicts among the subcontractors
Modified Interaction of the work of subcontractors, which lead to delay of the work	Modified Interaction of the work of subcontractors, which lead to delay of the work

(continued)

Causes retrieved from literature	Causes selected based on pilot study
<p>2. <i>Factors caused by subcontractors</i> Non-adherence to the construction schedule (Al-Hammad, 1993) Project delays (Al-Hammad, 1993; Sambasivan and Soon, 2007)</p>	<p>Added Added Added</p> <p>Awarding the specific subcontractor because of his low price only Low experience and low capability of the main contractor Incomplete understanding of the main contractor to the contract documents</p>
<p>Non-adherence to the time schedule Delay of the works behind the time schedule Failure to preserve and take care of the materials Exhausting the plant and resources of the main contractor Partnering the works to another subcontractor without getting approval of the main contractor Absence of the subcontractor from the site Involvement of the subcontractor in several projects at the same time Neglecting the instructions of the main contractor Shortage of skilled labour with the subcontractor Non-adherence to the conditions of the contract</p> <p>Selected Selected Added Added Added Added Added Added Selected Selected Selected Selected</p> <p>Lack of construction quality work</p>	<p>Non-adherence of the subcontractor to the time schedule Delay of the works behind the time schedule Failure to preserve and take care of the materials Exhausting the plant and resources of the main contractor Partnering the works to another subcontractor without getting approval of the main contractor Absence of the subcontractor from the site Involvement of the subcontractor in several projects at the same time Neglecting the instructions of the main contractor Shortage of skilled labour with the subcontractor Non-adherence to the conditions of the contract</p>
<p>Master and slave syndrome (Othman, 2002) Shortage of skilled labour (Enshassi <i>et al.</i>, 2007; Al-Hazmi, 1987) Non-adherence to the conditions of the contract (Huang <i>et al.</i>, 2008; Al-Hammad, 1993) Poor quality products (Othman, 2002; Al-Hammad, 1993; Al-Hazmi, 1987; Huang <i>et al.</i>, 2008) Professional skill (Al-Hazmi, 1987)</p>	<p>Selected Modified Added Selected Selected</p> <p>Lack of experience of the subcontractor in similar projects Shortage of equipment or machinery at the subcontractor Neglecting the safety measures Changes in material and labour costs</p>
<p>Lack of safety (Enshassi <i>et al.</i>, 2008; Al-Hammad, 1993) Changes in material and labour costs (Al-Hammad, 1993)</p> <p>3. <i>Factors caused by the owner</i></p>	<p>Added Modified</p> <p>Awarding the tender to the contractor with lowest price Delay in providing the information such as additional drawings, benchmarks, set-backs, etc. Giving instructions to the subcontractor directly without consulting the main contractor Objection of the owner on the implementation method used by the subcontractor</p>
<p>Variation orders (Al-Hammad, 1993; Enshassi <i>et al.</i>, 2007)</p>	<p>Modified</p> <p>Using several variation orders</p>

(continued)

Table III.

Causes retrieved from literature	Selected Added	Causes selected based on pilot study
Delay in releasing payments to the main contractor (Al-Hammad, 1993; Al-Hazmi, 1987)	Selected Added	Delay in releasing payments to the main contractor Short period allowed for implementing the project
<i>4. Factors caused by the consulting office</i>		
Incomplete work-drawings or specifications (Al-Hammad, 1993; Alinaitwe <i>et al.</i> , 2007)	Added Selected	Contradiction among the tender documents Ambiguity of the drawings and technical specifications
Delay in shop drawings and sample material approval (Al-Hammad, 1993)	Selected	Delay in approving materials samples and shop drawings
Delay of approval for the finished work (Al-Hammad, 1993; Alinaitwe <i>et al.</i> , 2007; Al-Hazmi, 1987)	Modified	Delay in hand-over of subcontractor's works
Poor supervision (Huang <i>et al.</i> , 2008)	Modified	Low experience of the consultant's team
<i>5. Factors caused by the external factors</i>		
Shortage of construction materials (Al-Hammad, 1993; Enshassi <i>et al.</i> , 2007; Alinaitwe <i>et al.</i> , 2007)	Selected	Shortage of construction materials in the market
Weather conditions (Huang <i>et al.</i> , 2008)	Selected	Weather conditions
Geological problems on the site (Huang <i>et al.</i> , 2008)	Selected	Geological problems on the site
Late project delivery (Hinze and Tracy, 1994)	Selected	Breach of the contract due to project termination
Poor contract management (Othman, 2002)	Added	Closing the commercial border crossings
Lack of cooperation (Moore <i>et al.</i> , 1992)	Merged	
Legal disputes between various parties and the construction project (Al-Hammad, 1993; Proctor, 1996)	Merged	
Late payment (Al-Hazmi, 1987)	Merged	
The low productivity (Enshassi <i>et al.</i> , 2007; Alinaitwe <i>et al.</i> , 2007)	Merged	
Reduction in payment (Hinze and Tracy, 1994)	Merged	
Poor communication (Hinze and Tracy, 1994; Othman, 2002; Moore <i>et al.</i> , 1992)	Merged	
Lack of management systems (Huang <i>et al.</i> , 2008)	Merged	
Limited trust (Moore <i>et al.</i> , 1992)	Deleted	
Access to the site (Al-Hammad, 1993)	Deleted	

Causes of problems	Both groups		Contractors		Subcontractors	
	RII	Rank	RII	Rank	RII	Rank
Assigning part of the works to new subcontractor, without informing the original subcontractor	0.949	1	0.958	1	0.940	1
Main contractor's financial problems	0.940	2	0.944	2	0.937	2
Delay in contract progress payments	0.930	3	0.923	3	0.937	2
Delay by the main contractor in providing the necessary materials to the subcontractor	0.886	4	0.909	4	0.863	4
Low experience and low capability of the main contractor	0.853	5	0.863	5	0.842	7
Failure of the main contractor to use the insurance in case of injury of subcontractor's labour	0.851	6	0.825	10	0.877	3
Failure to provide necessary clarifications of the drawings to the subcontractor	0.846	7	0.846	8	0.846	6
Interaction of the work of subcontractors, which lead to delay of the work	0.846	7	0.853	7	0.839	8
Delay in shop drawings and sample material approval	0.837	8	0.821	11	0.853	5
Delay of the main contractor in submitting the formal documents to the supervision staff, which leads to delay in implementing the works	0.835	9	0.832	9	0.839	8
Incomplete understanding of the main contractor to the contract documents	0.828	10	0.856	6	0.800	10
Providing low-quality materials that result in low-quality workmanship	0.826	11	0.814	12	0.839	8
Awarding the specific subcontractor because of his low price only	0.826	11	0.856	6	0.796	11
Failure to provide the subcontractor with essential services such as electricity, water, etc.	0.811	12	0.796	13	0.825	9
Scheduling conflicts among the subcontractors	0.770	13	0.758	14	0.782	12
Scheduling conflicts between the contractor and the subcontractor	0.763	14	0.758	14	0.768	13
Interruptions and termination of work by the contractor	0.742	15	0.744	15	0.740	15
Failure to provide proper security for the site and plant	0.730	16	0.712	16	0.747	14
Using distant location for storage of materials	0.702	17	0.702	17	0.702	16
Frequent absence of the main contractor from the site	0.639	18	0.663	18	0.614	17
Involvement of the main contractor in several projects at the same time	0.604	19	0.611	19	0.596	18
All factors	0.810		0.812		0.809	

Table IV.
Ranks and RII of
causes of problems by
contractors

important factor leading to problems caused by general contractors group. The survey results agree with Huang *et al.* (2008) who emphasized that communication problems might lead to problems between contractors and subcontractors. Moore *et al.* (1992) emphasized that poor cooperation, limited trust, and ineffective communication lead to an adversarial relationship between the main contractor and subcontractor.

Main contractor's financial problem was ranked as the second most important cause of problems by both the contractors and subcontractors with RII of (0.940). Also, each respondents group separately ranked it in the second position with RII of (0.944) and (0.937), respectively. Delay in contract progress payments was ranked as the third most

important cause of interface problems by both the contractors and subcontractors with RII of (0.930). The responding contractors ranked this factor in the third position with RII of (0.923) while the subcontractors ranked it in the second position with RII of (0.937). The two causes were important factors leading to problems caused by main contractors group, since the financial problems of the main contractor and delay in payments to the subcontractor will impose financial difficulties on the subcontractor and make him unable to pay for the workers and suppliers, which leads to delay in completing the works on time and with the required quality. The survey results agree with Al-Hammad (1993) who emphasized that the delay in contract progress payments and the main contractor's financial problems were ranked as the most important causes of problems. Hinze and Tracy (1994), Fah (2006) and Othman (2007) emphasized that non timely payment lead to problems between contractors and subcontractors.

The results revealed that the delay by the main contractor in providing the necessary materials to the subcontractor was ranked as the fourth most important cause of problems by both the contractors and subcontractors with RII of (0.886). Also, each of them separately ranked it in the fourth position with RII of (0.909) and (0.863), respectively. This emphasizes that the causes is an important factor leading to problems caused by main contractors group, since delay in providing the material may lead to delay of implementing the works and eventually delay in project completion. The survey results agree with Al-Hammad (1993) who ranked this factor as an important cause of problems. Fah (2006) emphasized that the shortage of materials lead to problems between contractors and subcontractors.

Spearman rank correlation coefficient. For the group of factors related to causes of interface problems caused by main contractors, the correlation coefficient equals to 0.88 with p -value (sig.) = 0.000. The p -value is less than the level of significance, $\alpha = 0.05$, so there is a good agreement between the contractors and subcontractors.

Causes of problems by subcontractors

Table V shows the responses about the factors leading to problems caused by subcontractors according to RII.

As shown in Table V, the non-adherence to the conditions of the contract was perceived as the most important cause of contractor and subcontractors problems by both the contractors and subcontractors with RII of (0.932). The responding contractors ranked this factor in the first position with RII of (0.919) while the subcontractors ranked it in the second position with RII of (0.944). The results emphasize the importance of this factor, because the non-adherence to the conditions of the contract may lead to delay and quality degradation in projects. The survey results agree with Al-Hammad (1993) who emphasized that the non-adherence to the conditions of the contract was one of the most important causes of problems. Huang *et al.* (2008), Othman (2007) and Fah (2006) agreed that the emphasis on this factor leads to problems between contractors and subcontractors.

Delay of the works behind the time schedule was ranked as the second most important cause of contractor and subcontractors problems by both the contractors and subcontractors with RII of (0.926). The responding contractors ranked this factor in the fourth position with RII of (0.905) while the subcontractors ranked it in the first position with RII of (0.947). Non-adherence to the construction schedule was perceived as the third most important cause of contractor and subcontractors problems by both the contractors

Causes of problems	Both groups		Contractors		Subcontractors	
	RII	Rank	RII	Rank	RII	Rank
Non-adherence to the conditions of the contract	0.932	1	0.919	1	0.944	2
Delay of the works behind the time schedule	0.926	2	0.905	4	0.947	1
Non-adherence of the subcontractor to the time schedule	0.919	3	0.895	5	0.944	2
Lack of construction quality work	0.917	4	0.909	3	0.930	3
Neglecting the instructions of the main contractor	0.888	5	0.916	2	0.860	5
Shortage of skilled labour with the subcontractor	0.864	6	0.849	8	0.879	4
Failure to preserve and take care of the materials	0.861	7	0.863	7	0.860	5
Exhausting the plant and resources of the main contractor	0.851	8	0.874	6	0.828	8
Absence of the subcontractor from the site	0.837	9	0.835	9	0.839	7
Partnering the works to another subcontractor without getting approval of the main contractor	0.825	10	0.800	11	0.849	6
Shortage of equipment or machinery at the subcontractor	0.816	11	0.814	10	0.818	9
Changes in material and labour costs	0.796	12	0.800	11	0.793	10
Involvement of the subcontractor in several projects at the same time	0.747	13	0.765	12	0.730	11
Lack of experience of the subcontractor in similar projects	0.718	14	0.737	13	0.698	13
Neglecting the safety measures	0.689	15	0.667	14	0.712	12
All factors	0.839		0.836		0.842	

Table V.
Ranks and RII of
causes of problems
by subcontractors

and subcontractors with RII of (0.919). The responding contractors ranked this factor in the fifth position with RII of (0.895) while the subcontractors ranked it in the second position with RII of (0.944). The results emphasize that, these causes are important factors leading to interface problems caused by subcontractors group. The importance of these factors is due to the delay behind the time schedule may lead to financial penalties and poor reputation for both the contractors and subcontractors. The obtained results agree with Al-Hammad (1993) who emphasized that the delay of the works behind the time schedule was ranked as one of the most important causes of problems. Huang *et al.* (2008) emphasized that poor planning and scheduling lead to problems between the main contractor and subcontractor. Proctor (1996), Fah (2006) and Sambasivan and Soon (2007) emphasized that the delay behind the time schedule lead to problems between the main contractor and subcontractor. Othman (2007) emphasized that poor management caused problems between the main contractor and subcontractor.

Lack of construction quality work was ranked as the fourth most important cause of contractor and subcontractors problems by both the contractors and subcontractors with RII of (0.917). The responding contractors ranked this factor in the third position with RII of (0.909) while the subcontractors ranked this cause in the third position with RII of (0.930). The results emphasize that the lack of construction quality work is an important factor leading to problems caused by subcontractors group. The importance of this factor is due to the fact that lack of quality usually leads to re-work and delays and cost overruns which are not preferred by any of the project parties. The survey results agreed with Al-Hammad (1993) who ranked this in the second position. Othman (2007) who emphasized that poor quality products cause problems between the main

contractor and subcontractor. Huang *et al.* (2008) emphasized that all of the problems were caused due to deficient experiences.

Neglecting the instructions of the main contractor was ranked in the second position by the responding contractors with RII of (0.860). The survey results agree with Hinze and Tracy (1994) and Othman (2007) who emphasized that poor communication and poor management caused problems between the main contractor and subcontractor. Neglecting the safety measures was ranked in the last position by both the contractors and subcontractors with RII of (0.689). The responding contractors ranked this factor in the last position with RII of (0.667) while the subcontractors ranked it to be close to last position with RII of (0.712). However, the survey results do not agree with Al-Hammad (1993) who ranked this factor at an intermediate position. These results were expected since the safety measures were not given enough attention in Gaza Strip by both the contractors and subcontractors. Lack of experience of the subcontractor in similar projects was ranked in the last position by the responding subcontractors with RII of (0.698). The responding contractors have perceived the lack of experience of the subcontractor in similar projects as second least important cause of interface problems. The survey results do not agree with Huang *et al.* (2008) who emphasized that all of the interface problems were caused due to deficient experiences. The non-agreement is because the construction projects in Gaza do not necessarily require high experience on part of the subcontractors.

Spearman rank correlation coefficient. For the group of factors related to factors leading to interface problems caused by subcontractors, the correlation coefficient equals to 0.84 with *p*-value (sig.) = 0.000. The *p*-value is less than the level of significance, $\alpha = 0.05$, so there is a good agreement between the contractors and subcontractors in this group.

Causes of problems by the owner

Table VI shows the responses about the factors leading to problems caused by the owner according to relative index.

As shown in Table VI, the delay in releasing payments to the main contractor was perceived as the most important cause of problems by both the contractors and subcontractors with RII of (0.900). Also, each group ranked this cause in the first position

Causes of problems	Both groups		Contractors		Subcontractors	
	RII	Rank	RII	Rank	RII	Rank
Delay in releasing payments to the main contractor	0.900	1	0.895	1	0.905	1
Awarding the tender to the contractor with lowest price	0.872	2	0.846	3	0.898	2
Giving instructions to the subcontractor directly without consulting the main contractor	0.846	3	0.867	2	0.825	4
Using several variation orders	0.833	4	0.818	4	0.849	3
Objection of the owner on the implementation method used by the subcontractor	0.798	5	0.814	5	0.782	5
Delay in providing the information such as additional drawings, benchmarks, set-backs, etc.	0.775	6	0.779	6	0.772	6
Short period allowed for implementing the project	0.742	7	0.733	7	0.751	7
All factors	0.824		0.822		0.826	

Table VI.
Rank and RII of causes of problems by the owner

with RII of (0.895) and (0.905), respectively. The results emphasize the importance of this factor, because the delay of payment may lead to delay in payment to the subcontractors, labourers, and material suppliers. The survey results agree with Al-Hammad (1993) who emphasized that the delay in contract progress payments was ranked in a first position. Othman (2007) and Fah (2006) emphasized that the delay of payments may lead to problems between contractors and subcontractors. Arditi and Chotibhongs (2005) found that if owners paid general contractors on time, then the timing of general contractors' payments to their subcontractors could be improved significantly.

Awarding the tender to the contractor with lowest price was ranked as the second most important cause of problems by both the contractors and subcontractors with RII of (0.872). The responding contractors ranked this factor in the third position with RII of (0.846) while the subcontractors ranked it in the second position with RII of (0.898). The results emphasize the importance of this factor in leading to problems caused by owner, because when the main contractor has low prices in his contract, he would give the subcontractors lower prices that may lead to quality degradation and other problems during the implementation. Giving instructions to the subcontractor directly without consulting the main contractor was perceived as the third most important cause of problems with RII of (0.846). The responding contractors ranked this factor in the second position with RII of (0.867) while the subcontractors ranked it in the fourth position with RII of (0.825). The results emphasize the importance of this factor leading to interface problems caused by owner, because the main contractor is an essential part of the contracting with the owner, and hence the instructions and communications should be through him.

Spearman rank correlation coefficient. For the group of factors related to causes of interface problems caused by owner, the correlation coefficient equals to 0.89 with p -value (sig.) = 0.000. The p -value is less than the level of significance, $\alpha = 0.05$, so there is a good agreement between the contractors and subcontractors in this group.

Causes of problems by the consulting office

Table VII shows the responses about the factors leading to interface problems caused by the consulting office according to relative index.

As shown in Table VII, the delay in hand-over of subcontractor's works was ranked as the most important cause of problems with RII of (0.856). Also, each group ranked this cause in the first position with RII of (0.867) and (0.846), respectively. The delay in hand-over of works leads to loss of time of the subcontractors' workers, and hence creates problems with the main contractor. The survey results agree with

Causes of problems	Both groups		Contractors		Subcontractors	
	RII	Rank	RII	Rank	RII	Rank
Delay in hand-over of subcontractor's works	0.856	1	0.867	1	0.846	1
Delay in approving materials samples and shop drawings	0.837	2	0.839	2	0.835	2
Ambiguity of the drawings and technical specifications	0.805	3	0.821	3	0.789	3
Low experience of the consultant's team	0.804	4	0.821	3	0.786	4
Contradiction among the tender documents	0.802	5	0.821	3	0.782	5
All factors	0.821		0.834		0.808	

Table VII.
Ranks and RII of causes
of problems by the
consulting office

Al-Hazmi (1987) who emphasized that delay in approving subcontractor's works lead to problems between the main contractor and subcontractor. Delay in approving materials samples and shop drawings was perceived as the second most important cause of problems with RII of (0.837). Also, each group ranked it in the second position with RII of (0.839) and (0.835), respectively. The results emphasize that, this is an important factor leading to problems caused by consulting office, because the delay in approving materials samples and shop drawings leads to loss of time of the subcontractors' works, and hence initiates problems with the main contractor. The survey results agree with Al-Hammad (1993) who ranked this factor as one of the important causes of problems. Also, Othman (2007) emphasized that lack of information on site caused problems between the main contractor and subcontractor. Ambiguity of the drawings and technical specifications was perceived as the third most important cause of problems with RII of (0.805). Also, each group ranked this cause in the third position with RII of (0.821) and (0.789), respectively. The results emphasize that, this is an important factor leading to problems caused by consulting office group. However, this factor has moderate importance because the ambiguity of the drawings and technical specifications is usually discussed and clarified between the contractor and the consulting office before delegating works to the subcontractors.

Spearman rank correlation coefficient. For the group of factors related to causes of interface problems by consulting office, the correlation coefficient equals to 0.75 with p -value (sig.) = 0.000. The p -value is less than the level of significance, $\alpha = 0.05$, so there is a good agreement between the contractors and subcontractors in this group.

Causes of problems by the external factors

Table VIII shows the responses about the factors leading to problems caused by the external factors according to relative index.

As shown in Table VIII, the shortage of construction materials in the market was perceived as the most important cause of problems with RII of (0.796). Also, each group ranked this factor in the first position with RII of (0.789) and (0.804), respectively. The results emphasize that this cause is the most important factor leading to problems caused by external factors and it has special importance in Gaza Strip that usually suffers from closure of borders and lack of construction materials. The survey results agree with Al-Hammad (1993) who emphasized that the shortage of construction materials in the market lead to conflicts between contractors and subcontractors. On the other hand, it is shown that, the breach of the contract due to project termination was ranked as the second most important cause of problems with RII of (0.702). Also, each group ranked the breach of the contract due to project termination in the second

Causes of problems	Both groups		Contractors		Subcontractors	
	RII	Rank	RII	Rank	RII	Rank
Shortage of construction materials in the market	0.796	1	0.789	1	0.804	1
Breach of the contract due to project termination	0.702	2	0.730	2	0.674	2
Closing the commercial border crossings	0.688	3	0.702	3	0.674	2
Weather conditions	0.582	4	0.547	5	0.618	3
Geological problems on the site	0.579	5	0.600	4	0.558	4
All factors	0.669		0.674		0.665	

Table VIII.
Rank and RII of causes of problems by the external factors

position with RII of (0.730) and (0.674), respectively. The survey results agree with Al-Hammad (1993) who emphasized that project termination created conflict between contractors and subcontractors. From contractors' and subcontractors' point of view this factor is a second factor in this group caused by the external factors.

Weather conditions and geological problems on the site were ranked in the last position by the responding contractors and subcontractors with RII of (0.582) and (0.579), respectively. The survey results agree with Al-Hammad (1993) who found that these factors were ranked in the last position. Huang *et al.* (2008) emphasized that these factors involved natural reasons, which could not be controlled by human beings. From contractors' and subcontractors' point of view these factors are the least important factors caused by the external factors.

Spearman rank correlation coefficient. For the group of factors related to causes of interface problems caused by external factors, the correlation coefficient equals to 0.75 with p -value (sig.) = 0.000. The p -value is less than the level of significance, $\alpha = 0.05$, so there is a good agreement between the contractors and subcontractors in this group.

Comparison between all groups concerning contractor-subcontractor problems

As shown in Table IX, the opinions of the respondents about the groups of factors leading to the contractor-subcontractor problems are tabulated according to relative index.

The factors caused by subcontractors were ranked as the most important cause of problems with RII of (0.839). Also, each group ranked it in the first position with RII of (0.836) and (0.842), respectively. This emphasizes that, this is the most important group of factors leading to problems between contractors and subcontractors, since the commitment of the subcontractor to the time schedule, quality and contract terms assist preventing several interface problems. On the other hand, as shown in Table IX, "factors caused by owner" was ranked in the second position by both the contractors and subcontractors with RII of (0.824). The responding contractors ranked this group in the third position with RII of (0.822), while the subcontractors ranked it in the second position with RII of (0.826). The results emphasize the importance of this group from both groups' point of view in leading to the contractor-subcontractor problems, since the timely payments by the owner to the contractor can drastically reduce the interface problems.

"Factors caused by consulting office" was ranked in the third position by both the contractors and subcontractors with RII of (0.821). The responding contractors ranked this group in the second position with RII of (0.834) while the subcontractors ranked it in the fourth position with RII of (0.808). However, the cooperation and speed

Group	Both groups		Contractors		Subcontractors	
	RII	Rank	RII	Rank	RII	Rank
Factors caused by subcontractors	0.839	1	0.836	1	0.842	1
Factors caused by the owner	0.824	2	0.822	3	0.826	2
Factors caused by the consulting office	0.821	3	0.834	2	0.808	4
Factors caused by main contractors	0.810	4	0.812	4	0.809	3
Factors caused by the external factors	0.669	5	0.674	5	0.665	5
Total factors	0.808		0.809		0.807	

Table IX.
Rank and RII of
groups leading to the
contractor-subcontractor
problems

of the consulting office prevents several problems. "Factors caused by the external factors" was ranked in the last position by both the contractors and subcontractors with RII of (0.669). Also, each group ranked it in the last position with RII of (0.674) and (0.665), respectively. However, this group was the least important among groups leading to the contractor-subcontractor problems. The survey results agreed with Al-Hammad (1993) who found that these factors were ranked in the last position. Huang *et al.* (2008) emphasized that these factors involved natural reasons, which could not be controlled by human beings.

Spearman rank correlation coefficient. For the group of factors related to groups factors leading to interface problems, the correlation coefficient equals to 0.70 with p -value (sig.) = 0.000. The p -value is less than the level of significance, $\alpha = 0.05$, so there is a good agreement between the contractors and subcontractors in this group.

Top ten causes of problems between contractor and subcontractors

Table X shows the top ten causes of contractor-subcontractor problems.

As shown in Table X, "assigning part of the works to new subcontractor, without informing the original subcontractor" related to factors leading to problems caused by contractors group was ranked in the first position by both the contractors and subcontractors with RII of (0.949). The survey results agreed with Huang *et al.* (2008) who emphasized that communication problems might lead to problems between contractors and subcontractors. Moore *et al.* (1992) emphasized that poor cooperation, limited trust, and ineffective communication lead to an adversarial relationship between the main contractor and subcontractor. "Main contractor's financial problems" related to factors leading to problems caused by contractors group was ranked in the second position by both the contractors and subcontractors with RII of (0.940). The survey results agreed with Al-Hammad (1993) emphasized that main contractor's financial problems lead to problems between contractors and subcontractors.

Causes of interface problems	Both groups		Group
	RII	Rank	
Assigning part of the works to new subcontractor, without informing the original subcontractor	0.949	1	Main contractors
Main contractor's financial problems	0.94	2	Main contractors
Non-adherence to the conditions of the contract	0.932	3	Subcontractors
Delay in contract progress payments	0.93	4	Main contractors
Delay of the works behind the time schedule	0.926	5	Subcontractors
Non-adherence to the construction schedule (consequently delays the progress of the activities of the other party)	0.919	6	Subcontractors
Lack of construction quality work (either the contractor or any of his subcontractors)	0.919	6	Subcontractors
Delay in releasing payments to the main contractor	0.9	7	Owners
Neglecting the instructions of the main contractor	0.888	8	Subcontractors
Delay by the main contractor in providing the necessary materials to the subcontractor	0.886	9	Main contractors
Awarding the tender to the contractor with lowest price	0.872	10	Owners

Table X.
Top ten causes of problems between contractor and subcontractor

“Non-adherence to the conditions of the contract” related to factors leading to problems caused by subcontractors was ranked in the third position by both the contractors and subcontractors with RII of (0.932). The survey results agreed with Al-Hammad (1993) who emphasized that “Non-adherence to the conditions of the contract” was ranked in a high position. Othman (2007), Fah (2006) and Huang *et al.* (2008) emphasized this factor leads to problems between contractors and subcontractors. “Delay in contract progress payments” related to factors leading to problems caused by contractors group was ranked in the fourth position by both the contractors and subcontractors with RII of (0.930). This emphasizes that, this is an important factor leading to problems, because the financial problems of the main contractor and delay in payments to the subcontractor may impose financial difficulties on the subcontractor and limit their ability to pay for the workers and suppliers, which may lead to delay in the completing the works on time and with the required quality. The survey results agreed with Al-Hammad (1993) who emphasized that “Delay in contract progress payments” was ranked in high position, Hinze and Tracy (1994), Othman (2007) and Fah (2006) emphasized that non timely payment lead to problems between contractors and subcontractors.

“Delay of the works behind the time schedule” related to factors leading to problems caused by subcontractors group was ranked in the fifth position by both the contractors and subcontractors with RII of (0.926). The survey results agreed with Al-Hammad (1993) who emphasized that, “Delay of the works behind the time schedule” was ranked in a high position. Huang *et al.* (2008) emphasized that poor planning and scheduling lead to problems between the main contractor and subcontractor. Proctor (1996), Fah (2006) and Sambasivan and Soon (2007) emphasized that delay behind the time schedule leads to problems between the main contractor and subcontractor. Othman (2007) emphasized that poor management causes problems between the main contractor and subcontractor. “Lack of construction quality work” related to factors leading to problems caused by subcontractors group was ranked in the sixth position by both the contractors and subcontractors with RII of (0.919). The importance of this factor is due to the fact that lack of quality usually leads to re-work and losing time and money which is not preferred by any of the project parties, mainly the contractor and subcontractors. The obtained results agreed with Al-Hammad (1993) who ranked this in the second position. Othman (2007) who emphasized that poor quality products cause problems between the main contractor and subcontractor. Huang *et al.* (2008) emphasized that all of the problems are caused by deficient experiences.

“Delay in releasing payments to the main contractor” related to factors leading to problems caused by owner group was ranked in the seventh position by the both contractors and subcontractors with RII of (0.900). The survey results agreed with Al-Hammad (1993) who emphasized that delay in contract progress payments was ranked in a high position. Othman (2007) and Fah (2006) emphasized that delay of payments lead to problems between contractors and subcontractors. Arditi and Chotibhongs (2005) found that if owners paid general contractors on time, then the timing of general contractors’ payments to their subcontractors could be improved significantly. “Neglecting the instructions of the main contractor” related to factors leading to problems caused by subcontractors group was ranked in the eighth position by the both contractors and subcontractors with RII of (0.888). The survey results agree with Hinze and Tracy (1994) and Othman (2007) who emphasized that poor

communication and poor management caused problems between the main contractor and subcontractor.

“Delay by the main contractor in providing the necessary materials to the subcontractor” related to factors leading to problems caused by contractors group was ranked in the ninth position by the both contractors and subcontractors with RII of (0.886). The survey results agree with Al-Hammad (1993) who ranked this factor as one the important factors. Fah (2006) emphasized that the shortage of materials lead to problems between contractors and subcontractors. “Awarding the tender to the contractor with lowest price” related to factors leading to problems caused by owner group was ranked in the tenth position by both the contractors and subcontractors with RII of (0.872).

Conclusion

A questionnaire survey was administered in this study to identify and rank problems which exist between contractors and subcontractors. In overall context, assigning part of the works to new subcontractor, without informing the original subcontractor, main contractor’s financial problems, non-adherence to the conditions of the contract, delay in contract progress payments, and delay of the works behind the time schedule are the most severe problems that affect the relationship between contractors and subcontractors. The factors caused by subcontractors group was ranked as the most important cause of problems. The findings of this study are important because the factors that cause problems between contractors and subcontractors are identified and ranked according to their relative importance. If these factors are addressed and monitored carefully, the relationship between contractors and subcontractors will be improved which may lead to dispute, delay, and cost overruns reduction.

Contractors are recommended to select the subcontractor according to their previous experience, reputation, and capabilities in terms of labour, equipment, and machinery, since these items ensure the commitment of the subcontractor to the contract conditions and ability to complete the works according to the time schedule and to achieve the best quality. The contractors should issue the financial payments to the subcontractor on the due time, since this would help in developing good reputation of the contractor and enable the subcontractors to cover their expenses, purchase the required materials, and pay for their labour on time. The contractors should discuss the works with the subcontractors to set the plans and identify responsibilities before starting the works. The contractors should use written contracts that identify responsibilities and keep the rights of all parties.

The subcontractors are recommended to employ sufficient number of qualified technical staff with appropriate experience and to arrange all required materials and equipment in order to be able to adhere to subcontract requirements and time schedule. The subcontractors should adhere to quality standards through using experienced labour, good materials, supervision of materials and, implementing the engineer’s instructions and doing the remedial works. The subcontractors should also communicate with the contractor and the site engineers effectively and implement their instructions to avoid any problems. The subcontractors are advised to use all safety measures to help protecting the task force. The owners are recommended to issue the financial payments for the contractor on time so that they can cover the payments for the subcontractors who in turn can purchase the required materials and pay for the task

force and complete the works without delay. The owners may issue an advance payment to the main contractor especially in large projects to ensure timely purchase of the required materials and to avoid the lack of materials in Gaza Strip due to closure, which is a frequent scenario.

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Further reading

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