

# CAUSES OF CONSTRUCTION DELAY IN UNRWA PROJECTS IN THE GAZA STRIP

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**ABSTRACT:** Construction delay causes time and cost overruns for both owners and contractors. Claims and disputes may also be created due to construction delay. This paper investigated the causes and levels of delay on 90 completed projects in the Gaza Strip. The investigated projects are public non-residential projects (mainly schools and medical centers).

The result of this research reveal that the main causes of construction delay are unavailability of materials, political instability, bad weather, design changes, additional works, owners delay, and site conditions. The improvement of materials supply to Gaza Strip by establishing an independent materials resource and improving the owner's contract document preparation will mitigate the delay of construction projects.

**KEYWORDS:** Delay causes, construction projects, economy, construction management

## 1. INTRODUCTION

The Palestinian economy may be characterized by its limited size. In 1999, the Gross Domestic Product (GDP) accounted for approximately US \$ 4.15 billion, the total population was approximately 2.8 million and thus the GDP per capita reached approximately \$ 1,500 [1].

The construction sector has enjoyed a steady increase since 1991. This may be referred to accumulate demand due to the 1st Intifada and to accommodate Palestinian returned from the gulf after the gulf war. By the end of 1996, the construction sector was employing 12.6% of the employed Palestinian workers [2]. However, the construction sector has suffered from a sharp decrease in demand due to the uncertain situation, income shortfall and imposed movement restrictions. Since the second Intifada began (in 2001), the construction sector has suffered losses an amount of 524 million dollars. The Palestinian economy is in a situation of great depending on Israel with regard to the external trade, fiscal revenues, and employment of workers [3].

Israel still controls the borders of the West Bank and Gaza Strip and this enables it to close off the Palestinian areas and sever their ties to the outside world. This causes a state of uncertainty to prevail among local and foreign investors, making them reluctant to invest in the Palestinian economy, and leading to prolonged stagnation. The closure includes banning movement of goods, factors of production and peoples within the Palestinian areas and between the Palestinian areas and Israel and the out side world [4].

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As a result of this situation, most of the construction projects durations were severely affected. The delay of construction projects is costly for both owners and contractors. Therefore, delay is an important issue for construction industry. It is important to investigate this problem area in order to mitigate their consequences.

## **2. BACKGROUND**

The United Nations Relief and Works Agency – Gaza (UNRWA) is one of the major agencies providing work for Palestinian people. It is responsible for building and operating schools, health centers and related social services in the Gaza Strip. One of the critical problems facing UNRWA has been frequent delays of Construction Projects since 1987 when the first Intifada started. The political issues like strikes, closures, curfew and the complicated interaction between the Palestinian economy and Israel have left their influences on construction industry. This causes a considerable amount of delay for construction projects. Furthermore, there are some other causes of delay such as owners delay, design changes, weather effect and site conditions.

UNRWA has its own classification of contractors. The contractors are classified for construction works into three categories "A", "B" and "C".

Class "C" contractors are assigned for very small projects, while class "A" contractors are assigned for large projects. Usually, UNRWA awards the contracts to the lowest bidder.

## **3. PREVIOUS WORK**

The issue of delay of construction projects was widely discussed in literature. Zain Al-Abedien (1983)[5], finds that the delayed projects represent 70% of public projects. Al-Sultan (1987) [6], accounted for 70% of public projects have been delayed. AL-Khalil and Al-Ghafly (1994)[7], find that 37% of water and sewage projects experienced delays. Al-Momani (2000) [8], finds that 81.5% of projects were delayed. Furthermore, he found that the reasons for delay were related to designers, user change, weather, site conditions, late deliveries, economic conditions and variation orders.

## **4. RESEARCH OBJECTIVES**

The objectives of this research are to:

- Determine the level and causes of delay in construction projects
- Explore the relationship between the delayed projects and contracting company characteristics.
- Find out the relationship between the delay of projects and its type and size.

## **5. METHODOLOGY**

The information of this research was obtained from the contract files which was selected randomly and represent the projects executed by UNRWA Construction Division during the period from 1996 to 2002. The sampling population was established by selecting 90 projects constructed in the Gaza strip by UNRWA during the period from 1996-2000. The projects surveyed can be divided into three types,

schools, additional classrooms and various special rooms (science laboratories, libraries, domestic science ...etc)

The study summarizes the results of this research which represents actual data collected from the real world of executed projects in the last seven years in Gaza Strip. Chi square tests were done to determine the significance of interrelated factors.

## 6. RESULTS

Forty one of contractors who executed the investigated project out of ninety (45.6%) are registered as class "A" contractors by UNRWA while 49 (54.4%) contractors are registered in "B" category (Table 1).

Table 2 shows that 28.9% of the contractors have less than 5 years of experience while 40% of the contractors have experience from 5-10 years. Fewer amounts (13.3%) have from 10-15 years of experience. Furthermore, 17.8% of the contractors have more than 15 years of experience. This reveals that about two-third of the contractors do not have long experience in implementing construction projects.

**Table 1 Contractor Classification**

	Contractor Class		Total
	A	B	
Number of contractors	41	49	90
% of contractors	45.6%	54.4%	100%

**Table 2 Profile of contractor's experience**

Experience (Years)	Number	%	Total
<5	26	28.9	28.9%
5-10	36	40	68.9%
10-15	12	13.3	82.2%
>15	16	17.8	100%
Total	90	100	

Table 3 shows that the delayed project accounted for some 85.4% of projects executed by "A" contractors and 71.4% of projects executed by "B" contractors with an overall average for all contractors of 77.8%. This indicates that most of the construction projects experienced delay. In order to test the null hypothesis that the frequency of delayed projects is independent of the classification of the contractors, chi square test was conducted using SPSS program. It is found that  $\chi^2 = 2.50$  and  $Pv = 0.113 > 0.05$ . Thus the null hypothesis can't be rejected that the frequency of delayed projects is independent of the classification of the contractors. Therefore, it can be concluded that the contractor classification is not a factor in the frequency of project delay.

**Table 3 Frequency of delayed projects classified by contractor class**

Project status	contractor class		Total
	A	B	
Delayed projects	35(85.4%)	35(71.4%)	70(77.8%)
On time projects	6(14.6%)	14(26.5%)	20(22.2%)
Total	41(100.0%)	49(100.0%)	90(100.0%)

**EXTENT OF PROJECT DELAY**

Table 4 shows the relationship between the period of delay and contractors classification. 17.1 % of the projects which were executed by class "A" contractors and 22.9% of the projects which were executed by class "B" contractors were delayed by less than one week. While 34.3% of "A" contractors projects and 37.1% of "B" class contractors projects were delayed from two to four weeks and around one- fifth of class "A" contractors (22.9%) and very few of "B" contractors projects (5.7%) were delayed by more than 12 weeks.

To test the null hypothesis that is the period of delay is independent of the classification of contractors. Chi square test was conducted. There is no significant differences ( $\chi^2 = 4.45$ ,  $P_v = 0.348$ ) referred to the period of delay which directs to accept the null hypothesis. Therefore, the period of delay is not related to the contractor's class.

**Table 4 Relationship between period of delay and contractor classification**

Delay period	contractor class		Total
	A	B	
<= 7 days	6(17.1%)	8(22.9%)	14(20.0%)
8-28 days	12(34.3%)	13(37.1%)	25(35.7%)
29-56 days	7(20.0%)	10(28.6%)	17(24.3%)
57-84 days	2(5.7 %)	2(5.7%)	4(5.7%)
>=85 days	8(22.9%)	2(5.7%)	10(14.3%)

The relationship between the contract period and the delayed projects is investigated. Table 5 shows that around half of delayed projects (45.1%) are medium size projects of a period from 85 to 272 days, while 63.2% of on time completed projects are of a medium size projects.

**Table 5 Relationship between contract period and timely completion of projects**

Contract period	Delayed	On time	Total
	projects	projects	
<= 84 days	14(19.7%)	5(26.3%)	19(21.1%)
85-272 days	32(45.1%)	12(63.2%)	44(48.9%)
>= 273 days	25(35.2%)	2(10.5%)	27(30.0%)

Many of investigated projects are delayed for several reasons. All extensions of time to the original schedule are considered as delays. Table 6 shows the reasons for projects delay in relation to type of projects. The main issue for delay is unavailability of

materials in the local market in 27 projects (22%). The second cause is political situation in 23 projects (18.7%) followed by bad weather in 22 projects (17.9%). The site conditions and delay of receiving testing results are the least reasons for delay and are found in 8 projects (6.4%).

**Table 6 Relationship between type of projects and causes of delay**

Causes of delay	Schools	Additional classes	Special rooms	Total
Bad weather	13	4	5	22 (17.9%)
Un-availability of materials	6	12	9	27 (22.0%)
Owner delay	3	3	3	9 (7.30%)
Political situation	11	6	6	23 (18.7%)
Late of material delivery	4	2	4	10 (8.20%)
Additional works	4	3	3	10 (8.20%)
Design changes	2	3	6	11 (8.90%)
Site conditions	3	-	2	5 (4.00%)
Delay of testing	1	-	2	3 (2.40%)
others	-	2	1	3 (2.40%)

It is clearly noticed that the major causes of delay are beyond the owners and contractors control. These causes are mainly the unavailability of construction materials and political situation. The two factors are causing a compensable delay in addition to time extension which would increase the projects final cost. It seems that the special location and situation for the Gaza Strip is a very effective factor in causing construction delay.

#### AMOUNT OF DELAY

**Table 7 Relationship between amount of delay and causes of delay**

Causes of delay	Total extension (days)	No. of delayed projects	% of extension	Average of extension by project ( days)
Bad weather	127	22	5.9%	5.77
Un-availability of materials	1172	27	54.1%	43.40
Owner delay	96	9	4.5%	10.66
Political situation	273	23	12.6%	11.87
Late of material delivery	154	10	7.1%	15.40
Additional works	117	10	5.4%	11.70
Design changes	156	11	7.2%	14.18
Site conditions	39	5	1.8%	7.8
Delay of testing	27	3	1.2%	9
others	5	3	0.20%	1.67
total	2166	123	100%	17.66

The amount of delay encountered by each cause of delay was calculated (Table 7). It is noticed that unavailability of material represents the max amount of delay given to contractors; about half of the delay (54.1%) are supposed to be given to this factor. The second is considered to political situation of 12.6%. The third and fourth reasons have considerable amount of delay are design changes (7.2%) and late delivery of materials (7.1%). While the least amount of delay is estimated 3% for both site conditions and delay of receiving testing results. Finally, not only the unavailability of construction materials and the political situation are the highest factors for delay but also they have represented two third of the extension of time periods (66.7%) given to the contractors during the investigated time scale.

## **7. DISCUSSION**

The investigated projects show that delay occurs frequently in most of UNRWA construction projects in the Gaza Strip. It seems that the most amount of delay happens in medium and large size projects rather than small projects. There are different causes for projects delay. The major effective causes are beyond the owners and contractors control which are unavailability of construction materials, political situation and bad weather.

The Gaza Strip has an odd situation. It depends on getting the construction material from the surrounding counties. Many difficulties are facing the suppliers in importing such materials. The political issues represent main causes for delay.

The second groups of causes for delay may be characterized as reason due to owner's acts. These reasons are owner delay, late of material delivery by owner, additional works and design changes. The design changes are the highest effective cause among other causes. The second is the additional works and late of material delivery. The design changes take long delays which may happen due to complicated procedures used by UNRWA to approve changes in design. Also, it seems that the delay may happen due to additional works which consumes considerable amount of time to consider. Furthermore, it seems that most of additional works are added at a late stage of project duration which needs additional time to execute.

## **8. CONCLUSION**

The delay of public construction projects is a very important factor in accomplishment of projects. It is found that very large number of projects experienced delays (77.8%). The medium and large size projects are characterized to have more delays than small projects.

The delay causes are found to be unavailability of construction materials, political situation, bad weather, design changes, additional works, late of material delivery, owners delay, site conditions, and delay of receiving testing results. In most of the delayed projects, the contractors were given an extension of time for construction delays. No relationship is found between the frequency of delay and the contractor's classification. Moreover, no relationship is found between the period of delay and the contractor's classification. The maximum amount of delay is referred to the political situation causes.

The delay causes can be mitigated considerably by improving the political environment and finding independent resources of construction material for the Gaza Strip. Further improvement is still needed for the owner's management of contracts documents to decrease the amount of design changes and additional works by employing more experienced professional persons to produce such documents.

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