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FACTORS AFFECTING THE CONSTRUCTION PROJECTS FINANCING COST*

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ABSTRACT:

Construction contractors in almost all projects have three main targets: to finish their projects within the scheduled time, with an acceptable quality, and within the assigned budget. This study is focused on the third target which is the financial part of the whole process. The study will attempt to identify the main factors affecting two of several financial keys that influence the contractor's cash flow. These two keys are the values of the financing cost and the maximum capital needs for any construction project. A unique type of construction projects is taken into consideration through this study, that is the building projects type. It has to be noted that both the financing cost and the maximum capital needs can have a serious effect on the project progress as well as on contractor's profit. So, studying the factors affecting these two values is very important. The contractor uses the financing cost and the maximum capital needs as indicators that enable him to pay more attention to make his project more successfully completed and more profitable.

KEY WORDS: Construction, Projects, Cost, Financing.

FACTEURS AFFECTANT LE COÛT DU FINANCEMENT DES PROJETS DE CONSTRUCTION

RESUME:

Entrepreneurs en construction de presque tous les projets ont trois objectifs principaux: pour terminer leurs projets dans les délais prévus, avec une qualité acceptable, et dans le budget attribué. Cette étude se concentre sur la troisième cible qui est la partie financière de l'ensemble du processus. L'étude tentera d'identifier les principaux facteurs affectant deux de plusieurs clés financiers qui influencent des flux de trésorerie de l'entrepreneur. Ces deux clés sont les valeurs du coût de financement et le capital maximum doit pour tout projet de construction. Un type unique de projets de construction est prise en compte dans cette étude, c'est le type de projets de construction. Il est à noter que tant le coût de financement et les besoins en capitaux au maximum peuvent avoir de graves répercussions sur l'état d'avancement du projet ainsi que sur le résultat entrepreneur. Ainsi, l'étude des facteurs qui influent sur ces deux valeurs est très important. L'entrepreneur utilise le coût de financement et le capital maximum doit d'indicateurs qui lui permettent d'accorder plus d'attention à rendre son projet plus réussi et plus rentable.

MOTS CLÉS: Construction, Projets, Coût, financement.

1. INTRODUCTION

Contractors usually have to finance a part of or the total project by using an external source of finance. Contractors should consider the cost of such money spent in financing their projects in the construction stage. Financing cost is the amount of money which the contractor must add to his costs when using an external source of finance while the maximum capital needs represent the maximum amount of money which the contactor will need through the project construction period. Keeping in mind that the contractor will bear the consequences in case of any inaccurate estimation for these values. As a consequence, his profit could be eroded or turned into a loss. The importance of estimating these values is to help the contractor in making decisions regarding bidding for new similar projects, controlling credit limit in case of borrowing from banks or any lending institutions and negotiating lower interest rates with bankers.

For that, the main factors that influence the cost of finance and the maximum capital needs must be identified. Previous cash flow studies badly tried to identify factors affecting the contractor cash flow in general. Martin [8] (1992) proposed a net cash flow model based on historic data, with the aim of discovering standard value curves. Browline et al. [10] (1987) studied the cash flow of several contracts in order to measure their capital needs and the main factors which influence these financial needs. They suggested the possibility of building an ideal value curve based on historic data, they have used ideal value curves to produce net cash flow profiles. Jaeho et al. [6] (2006) by using twenty five projects as an example. They found that; no close correlation between the figures of these projects, even when the projects were similar. Paul [11] (1978) analyzed projects collected from three construction companies, his conclusion was that; although the number of projects analyzed was statistically small, construction projects are individually unique and follow such diverse routs that value curves based on historical data are not capable of providing the accuracy required for contract control. He developed a computer program that estimated the shape of the value curve

defined by a series of more than twenty break points connected by a series of straight lines. From his value model, various cost categories with their associated time delays, contract value, profit, retention…were input to compute the resultant cash flow throughout the project. This approach has been adopted in commercial software packages. Kaka et al. [7] (1991) indicated that as construction projects are unique future attempts to standardize the cost /value relationship were likely to fail. They instead used a stochastic model based on historical data. Massoud [9] (2008) has developed an ANN model to predict the expected cost of finance and the maximum capital needs for a new construction project at its tendering stage as a percentage from the project contract value, taking into consideration that little information about the project cash flow and time schedule are known. Such study provides identification for the main factors affecting both financing cost and maximum capital needs. These factors were: project type, project duration, estimated contract value, down payment, time lag, interest rate, and mark up, time till first payment, retention percentage, project location, weather, and safety condition, possible increment in project duration, owner payment delay and inflation.

2. FACTORS AFFECTING FINANCING COST FOR CONSTRUCTION PROJECTS

Based on a comprehensive review for the previous works in the area of projects cash flow, the following were noticed as the most important factors affecting construction projects financing costs:

* **Project duration**: Project duration controls the contractor source and nature of loan. On project duration the contractor decides whether to go through a short term or long term loans to get the required finance to get pay for his project construction costs.
* **Down payment**: A regular procedure which often take place in almost all projects that the contractors request

down payment from their owners. This procedure reduces their negative cash flow and enhances their financial performance through their project construction life.

* **Mark-up**: The contractor mark up is a competitive sign which could lead the contractor to lose the tender of the project from the beginning. The amount of markup which the contractor will settle above his estimated expenses will be included in the total contract price. This amount of markup will affect the income flow of the contractor and as much as it could be high this will decrease the financing cost.

* **Time until first payment**: In all construction projects there is a negative cash flow amount occurs on the day when first interim payment is received. This negative cash flow increases if the time passed between the commencement project date and the time of first interim payment is increased.

* **Retention**: Owners always retain a certain percentage of the progress payments till the project ends without paying the contractor any interests on these funds. The least amount of this retained money the more enhancements for the contractor cash flow.

* **Project location**: A project located in desert area differs far much than a project located in an urban area. This differentiation appears in different characteristics like: labor salaries, equipments rental costs, availability of construction material and its costs, labor accommodation …).

* **Weather condition**: Weather affects both construction productivity and project calendar by changing the number of working days. Some kind of works must be executed in a certain weather conditions, welding as an example can not proceed in raining days. The unexpected changes in weather can cause a delay which increases the cost during construction without any compensation from the owner in most of times.

* **Safety regulation**: Smaller contractors may not place as high a priority on safety as bigger contractors for the higher expenses incurred in implementing the safety programs. Restricted safety regulations cost the contractor more than a relaxed safety regulation.

* **Inflation**: In times of economic uncertainty, the fluctuations in inflation rates and market interest rates affect projects profit. Hence, the owner's payments will not be changed while the contractor's expenses will badly increase with inflation. During periods of high inflation; the contractor profits are particularly vulnerable to delays caused by uncontrollable events for which the contractor will not be responsible.

3. RESEARCH AIM AND OBJECTIVE

The objective of this study is to make a high light on the main factors really affect the financing cost and the maximum capital needs specially in building construction projects. Another objective is to investigate and explain the relation between such high lighted factors and the value of both the financing cost and the maximum capital needs. As a consequence of this identification and explanation the contractor can improve his estimating accuracy for his financing cost and maximum capital needs. In order to achieve our goals; a number of past completed projects data will be collected and examined. The study will concentrate on data regarding the previous mentioned nine factors to be analyzed and investigated with both the financing cost and the maximum capital needs; these nine factors are: Project duration, Down payment, Inflation rate, Mark up, Retention, Safety regulations, Weather condition, Project location, Time till first payment.

4. RESEARCH METHODOLOGY

4.1 Data Collection

Data from 65 building project constructed in Egypt during the time frame 1/1/2001 to 31/12/2007 were gathered .The

P.D.	F.C. (% from contract value)	M. C. N. (% from contract value)
From 1:6 month	1.12	36.11
From 7:12 month	1.23	32.74
From 13:18 month	1.44	23.22
From 19:24 month	2.23	17.65
From 25:30 month	2.75	14.96
From 31:36 month	3.65	11.36

contract value for these building projects ranges from (238,351 to 38,765,689) Egyptian pounds. The contract duration of these projects ranges between 3 to 40 months. The largest public and private construction firms which are qualified and registered in the Egyptian Federation for Construction and Building Contractors as the first class companies executed these projects. From the analysis, data were extracted to include information regarding the nine factors under consideration in the study presented and the corresponding values for the financing cost and the maximum capital needs calculated as percentages from the contract value of each project.

4.2 Proposed Work

Data were gathered from past completed projects. Data for each project includes the value of the nine above mentioned factors and also the values of the financing cost and the maximum capital needs calculated as percentages from each contract value. Then, for each factor a data range value were made and the corresponding average value for the financing cost and the maximum capital needs percentages were calculated for the whole sample of projects group. Tables from (1) to (9) represent the range of data and the corresponding average values for the financing cost and the maximum capital needs. After that a nine graphical presentations were plotted to show the relation between the financing cost and the nine considered factors which were mentioned earlier and also another nine graphical presentations were plotted to show the relation between the maximum capital needs and the same nine factors. Figs. 1 thr' 9 represent these relationships.

Table (1): Project duration with the average values of financing cost and maximum capital needs.

Table (2): Down payment with the average values of financing cost and maximum capital needs.

D.P.	F.C. (% from contract value)	M. C.N.(% from contract value)
O	1.69	32.94
Up to 5%	1.37	32.92
up to 10%	1.11	26.75
Up to 15%	1.07	14.76

Table (3): Mark up with the average values of financing cost and maximum capital needs.

M.U. (%)	F.C. (% from contract value)	M.C.N.(% from contract value)
Up to 5%	2.65	41.29
Up to 10%	2.02	33.77
Up to 15%	1.65	30.12
Up to 20%	1.45	24.32
Up to 25%	1.32	20.18
Up to 30%	1.18	15.66

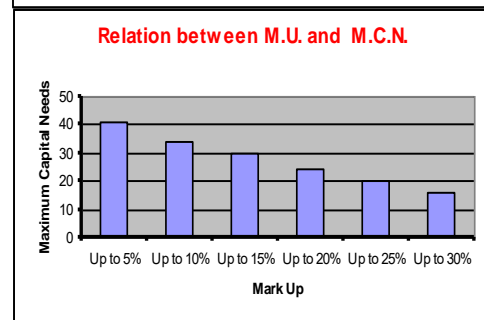**Table (4)**: Time till first payment with the average values of financing cost and maximum capital needs.

T.T.F.P.	F.C. (% from contract value)	M.C.N. (% from contract value)
1 month	1.23	21.33
2 months	1.44	26.44

Table (5): Retention with the average values of financing cost and maximum capital needs.

R. (%)	F.C. (% from contract value)	M.C.N. (% from contract value)
Up to 5%	1.30	22.31
Up to 10%	1.55	26.88
Up to 15%	1.98	31.25
Up to 20%	3.14	36.78

Table (6): Project location with the average values of financing cost and maximum capital needs.

P.L.	F.C. (% from contract value)	M.C.N. (% from contract value)
Desert	2.33	40.65
Urban	1.25	21.99

Table (7): Weather condition with the average values of financing cost and maximum capital needs.

W.C.	F.C. (% from contract value)	M.C.N. (% from contract value)
All season	1.23	18.60
Summer	1.55	25.96
Winter	1.41	45.03

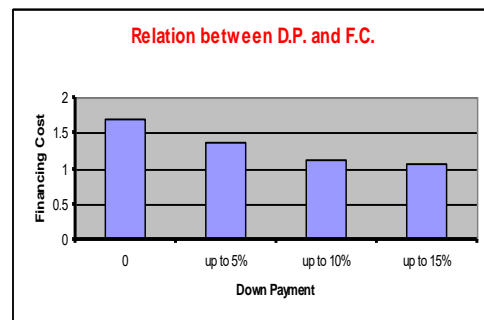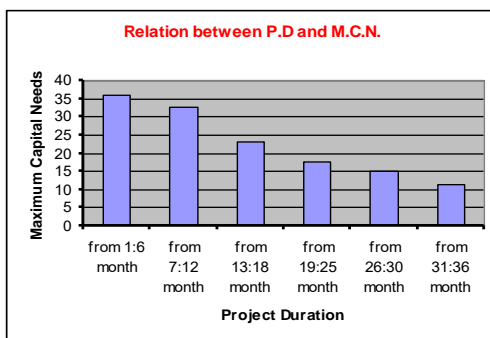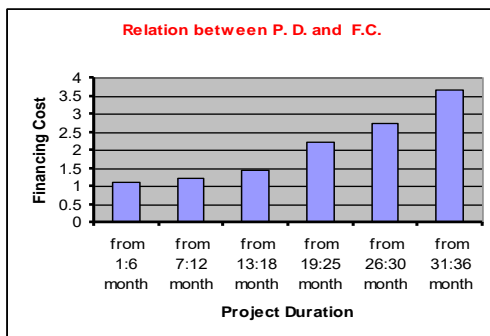**Table (8)**: Safety regulations with the average values of financing cost and maximum capital needs.

S.R.	F.C. (% from contract value)	M.C.N. (% from contract value)
Fair	1.29	49.19
Good	1.38	18.19
Excellent	1.50	22.67

Table (9): Inflation rate with the average values of financing cost and maximum capital needs.

I.R.	F.C.(% from contract value)	M.C.N.(% from contract value)
0.20	1.26	20.35
0.66	1.36	28.27
0.88	1.62	28.09

Fig. (1): Relation between project duration and both the financing cost and the maximum capital needs.

From Fig. (1), It can be clearly seen that the average value of the financing costs increases when the project duration increases. This means that for shorter project duration the financing costs are less than other projects extend for a longer periods of time. Fig. (1). also shows that the average value of the maximum capital needs decreases when the project duration increases. This means that for shorter project duration the maximum capital needs are much more than other projects extend for a longer periods of time.

A careful inspection to Fig. (2) can Show that the average value of the financing costs decreases with the increase in the value of project down payment. This means that, when the contractor is being paid a down payment from the project owner, this will help him to decrease his financing costs.
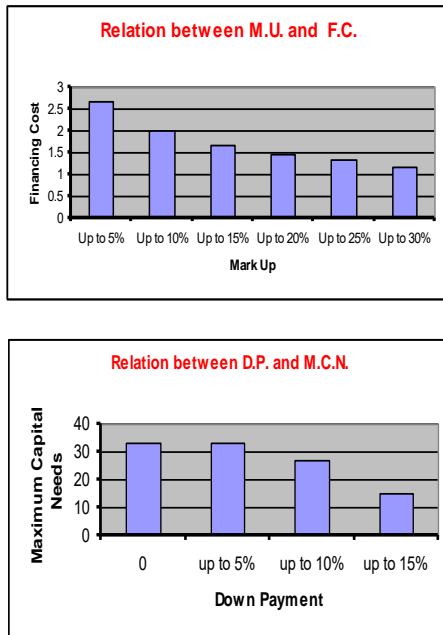

Fig. (2): Relation between down payment and both the financing cost and the maximum capital needs.

Fig. (2). Also shows that the average value of the maximum capital needs decreases with the increase in the value of the project down payment. This means that, if the contractor could have down payments from the project owner he will need a less maximum amount of

money to complete the construction of his project.

Relation between M.U. and F.C.
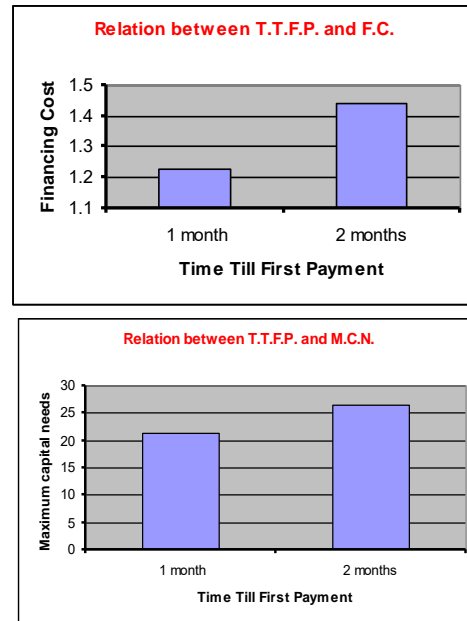
Relation between D.P. and M.C.N.

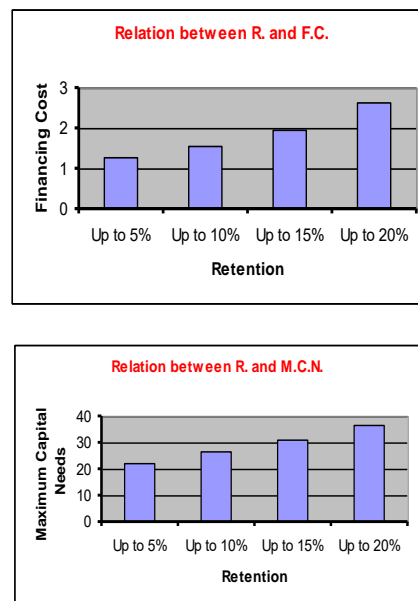**Fig. (3):** Relation between mark-up and both the financing cost and the maximum capital needs.

Fig. (3) makes it clear that the average value of the financing costs decreases with the increase of the mark-up value. As could as the contractor puts a high percentage of mark-up above his dry costs into the original offer presented to the project owner, this helps him to decrease his financing costs. Fig. (3). also shows that the average value of the maximum capital needs decreases with the increase of the mark-up value and this also is found to be logic.

Fig. (4) elaborate that the average value of the financing costs increases with the increase of the time expanded until first interim payment. Which means that, delaying the first payment to the contractor increases his financing costs. Fig. (4) shows also the same relation between the average value of the maximum capital needs and the time expended until first payment.

Fig. (5). explains the relation between the percentage of retention and both average values of financing cost and maximum capital needs. From the figure we can see that, both of the financing costs and the maximum capital needs increases with the increase of the retention percentage.
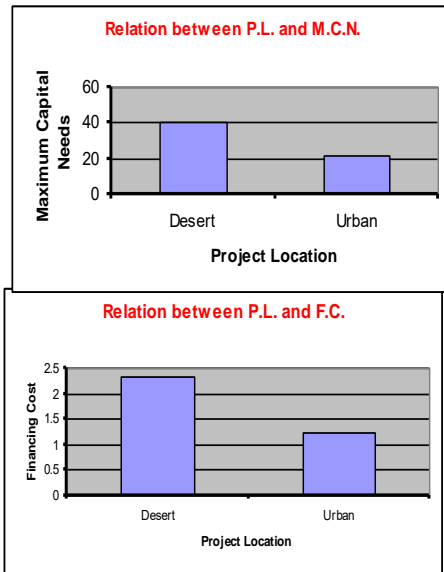
Relation between T.T.F.P. and F.C.

Relation between T.T.F.P. and M.C.N.

Fig. (4): Relation between time till first payment and both the financing cost and the maximum capital needs.

Relation between R. and F.C.

Relation between R. and M.C.N.

Fig. (5): Relation between retention and both the financing cost and the maximum capital needs.

Noticing that, retention is the amount of money which is being held with the project owner as a guarantee against the contractor work for a long period of time usually a year after the project completion without any

compensation from the owner to the contractor.

Fig. (6): Relation between project location and both the financing cost and the maximum capital needs

Fig. (6) elaborates the relation between project location and the average financing cost and maximum capital needs values. The figure shows that, both of the financing costs and the maximum capital needs increases in desert areas than in urban areas. This seems to be is logic because of the nature of desert areas differs a lot than in urban areas and to have a service in desert areas it cost a lot more than in urban areas. For the same project it costs more to be executed in desert areas than urban areas.

Fig. (7) makes it clear that the average financing cost and maximum capital needs values differs with the weather conditions. For the financing costs, projects which start execution in summer have high financing costs than projects start execution in winter and this also have a higher value of financing costs than projects executed through the whole year. For the maximum capital needs, projects which are executed in summer have a central value of financing costs between projects executed in winter and other projects executed through the whole year.
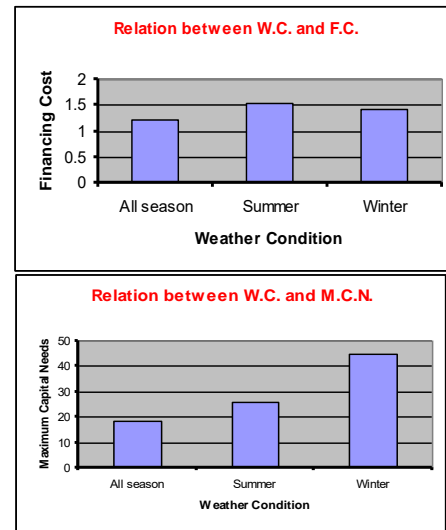
Fig. (7): Relation between weather condition and both the financing cost and the maximum capital needs.

Fig. (8) Shows the relation between safety regulations and both value of the financing cost and maximum capital needs. Financing costs are higher with projects have a restricted safety regulations and comes lesser with projects have a good or fair safety regulations while maximum capital needs differs than financing costs.


Fig. (8): Relation between safety regulations and both the financing cost and the maximum capital needs.

It comes higher with projects have a fair safety regulations and comes lesser with projects have a good or excellent safety regulations this is because projects with fair safety regulations have more related expenses to accidents and as a consequence insurance costs and damage repair costs will be more than projects with excellent safety regulations.
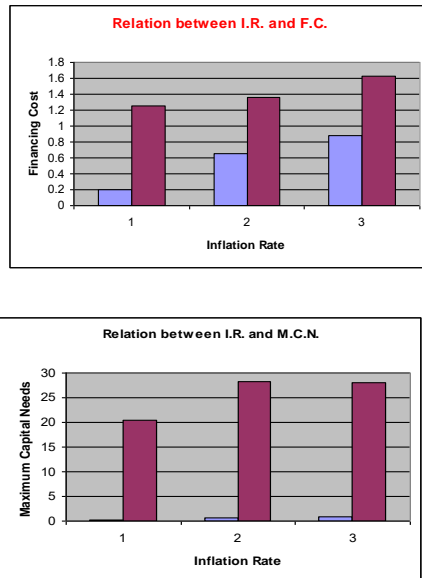
Fig. (9): Relation between inflation rate and both the financing cost and the maximum capital needs.

Fig.9. explain the relation between the inflation rate and the financing cost and maximum capital needs values. In days of economic uncertainty when inflation rates gets higher and higher, financing costs and maximum capital needs are getting higher.

5. RESULTS AND ANALYSIS

Heretofore, it has been indicated that 65 building projects were selected as a sample to investigate the relation between the financing cost and maximum capital needs values with a number of factors affecting on their values. The average value for both financing costs and maximum capital needs were calculated using a corresponding average values in the nine factors under discussion. A closer inspection to Figs. from (1) to (9) clearly shows that all the selected nine factors have a different effect in the values of both the financing costs and maximum capital needs

values. The financing cost is directly proportion to these nine selected parameters. Which are: project duration, project location, down payment, mark-up, and retention, weather condition, safety regulation, inflation rate and time till first payment. Certainly, financing cost was found to be inversely proportional to: down payment, mark up. The same is also true for the maximum capital needs value.

6. CONCLUSIONS AND RECOMMENDATIONS

This research paper has attempted to concentrate and explore the relation between the main factors that have the serious effect on both financing costs and maximum capital needs for the field of building projects. Nine factors were selected as a base for such investigation.

However, the results of this research clearly show that all the selected nine parameters have a series effect on both values of financing costs and maximum capital needs. One can easily say that the contractor can materially enhance his cash flow status by improving the efficiency of his contact terms as: insisting to have a down payment, decreasing the time expended until first payment, transferring the effect of inflation to the owner. He may also attempt to reduce the percentage of cash retention as possible. The impact of this cash retention on the different aspects of the contractor cash flow is also recommended for a future detailed study.

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