CASHFLOW FORECASTING IN THE CONSTRUCTION INDUSTRY: THE CASE OF GHANA

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Abstract

Research has shown that only one out of eight projects in the USA is successful (David and Trevor, 2011). Park, Seung and Rusells (2005) quoted Russell (1991) who found that more than 60% of construction contractor's failure is due to economic factors. Thus, when planning funding requirements of a business, it is more important to manage the likely cash requirements than to merely project profitability. Whilst profit is a vital indicator of the performance of a project, the generation of profit does not necessarily guarantee its realization development, or even survival. It is imperative to note that more businesses fail for lack of cash flow than for want of profit.

This paper discusses and highlights the results of a study conducted to determine, rate, and rank the significant factors that affect the cash flow of contractors in Ghana. The District Assembly Common Funded (DACF) project was used as a case study. The paper adopted the qualitative and quantitative research methods. In terms of quantitative methods, primary data was gathered through structured questionnaires distributed to contractors, consultants, district assemblies (clients) in the Ashanti and Brong Ahafo regions of Ghana. The sample size was drawn using the Kish (1965) method. In total, 123 out of 152 questionnaires were retrieved indicating 81% response rate.

Statistical analysis, using relative importance indices, significance testing and concordance testing revealed that 15 factors significantly affect the cash flow status of a contractor during the currency of construction projects. These factors were further categorised into either endogenous or exogenous groupings, based on the source of the factor and its effect on the construction firm. It was further revealed that cash flow factors could be considered to have contractor inclination or contractual influence depending on the extent of skewness of these factors to the former. The paper recommends that, to enhance effective productivity through cash flow systems, there must be a balance between the exogenous and endogenous factors, with the diligently undertaking risk analysis for the prospects of the project and the client making conscious effort not to violate the contractual factors.

Key words: Contractor, Significant Factors, Prediction, Endogenous, Exogenous, S-curve, Life-Cycle Costing

INTRODUCTION

A study conducted by Hohuabu in 2005 revealed only 17% of contractors practice cash flow prediction. About 41.5 % indicated that they hardly practice cash flow prediction with another 41.5% stating that they never practiced cash flow prediction in Ghana. While the importance of financial and cash-flow management is normally discussed at total company level, most of the models of cash flow prediction are individually developed for specific project.

Financial management has for long been recognized as an important strategic management tool. Since all investment involve risk taking, any firm which invests expects to make dividends at the end of the accounting year in return for his investment. It is expected that a well planned project cash flow pattern would enhance the ability to finance the project effectively. Managing cash flows is one of the most difficult tasks to undertake, because cash is one of the most unstable economic parameters. The uncertainty in estimating cash flows arises due to ambiguity in available data coupled with the numerous arbitrary assumptions, projections and forecast, which are also affected by both internal and external factors. Hohuabu (2004) postulated that poor project planning and fluctuation in local currency against the major world currencies were the main causes of construction cost escalation.

Cash flow prediction or projection is considered one of the most crucial steps in investment analysis, and should however not be confused with profit or profit flow. Profit is measured by an accountant based on an accrual concept. The term profit is also very ambiguous to explain. Imperatively, the later could mean profit in the short run which is different from profit in the long run or profit before tax, profit after tax, total profit or profit per share. Accordingly, changes in profit do not indicate corresponding changes in cash flow.

Many factors affect a contractor's cash flow hence dictating the shape of the S-curve (net cash flow curve) of the contractor. All factors affecting the contractor's cash inflow and outflow to some extent affect the shape of the S-curve both directly and indirectly. According to Buertey (2011) in Kaka (1995), over fifty (50) factors affect the cash flow of the Contractor.

Importance of a Contractor's Cash Flow Prediction

Chen et al (2007) stated that cash flow is the life of a business. Park et al (2005) quoting Singh et al (1992) states that cash is the most important of a construction company's resources. Whilst profit is a vital indicator of the performance of a business, the generation of profit does not necessarily guarantee its development, or even survival. It is imperative to note that more businesses fail for lack of cash flow than for want of profit. Most contractors working on construction projects suffer serious liquidity and cash flow problems.

Peers (1992) postulated that a proper cash flow management system is crucial for the survival of a construction firm because cash is one of the most important corporate resources and current asset for the day-to-day activities of a firm. A proper cash flow management system is also important as a means of obtaining loan from a bank or financial institution. Other capital markets are normally inclined to lend money to firms that

present periodic excellent cash flow forecast. Cash flow at the project level is important not only as a basis of company level cash flow but it should be practiced at different stages of the project life cycle starting at the bidding stage of the project where a decision to bid for a project can be influenced by financial considerations, such as capital cost, and maximum expenditure constraint.

Kaka (1995) held that an accurate cash flow prediction is essential at the tendering stage to all contractors. It provides contractors with the information regarding the amount of working capital required to perform a contract, the amount of interest that need to be paid to support an overdraft, and the evaluation of different tendering strategies. Kaka further added that ideally, cash flow prediction should be linked to the construction programme, schedules and bill of quantities.

Contractors are not only concerned with profit or turnover. An important factor that need to be considered in assessing the worth of a company or viability of a project is the return on capital invested. The latter has made enlightened contractors become more acutely aware of the need to maintain cash flow stream. For each project executed by a firm, it is expected that the estimates of amounts, uncertainty, and timing of the cash flow resulting from the investment would be carefully analysed on incremental basis throughout the project or production cycle (Pandey, 2002).

Cash is important for the day-to-day existence of a company and some contractors have suffered a downfall not because their work was not profitable but due to lack of cash in the short run. During periods of inflation, poor cash flow can lead to reduced profit, which in turn can produce a rippling effect on shareholders return. Xuequing (2005) after studying the critical success factors of infrastructural projects; held that most projects are abandoned at just 30% completion stage with just a few going through to completion thus meeting the stipulated contract duration and project characteristics. Park et al (2005) quoted Russell (1991) that more than 60% of construction contractor's failure is due to economic factors.

According to Ashworth (1995), the importance of cash flow prediction cannot be over emphasized. Amongst others, it is required for:

- Early price estimating,
- The setting of budgets and targets,
- Analysis of future financial position of the firm and
- Final accounting predictions and life cycle costing.

Over the years, some attempts have been made to improve the contractors estimating performance, since its achievement will help eliminate some of the variability in the prediction required by the client. Cash flows cannot be assumed to be equally distributed over the entire project duration. A peak in activity is often achieved about two-thirds way through the entire contract period (Kwakye, 1997). There is hence the need to prepare an expected cash flow related to the contractor's programme of activities. Financial control of any construction project commences at inception and continues until total completion or close of the project

In most cases, a contract budget which is a financial plan prepared to monitor and control

income and expenditure in any organization to measure performance is issued to determine cash flow requirements for the part or entire duration of the project. In addition, the budget serves as a yardstick against which actual performance is measured.

Contractor's Income Curve

The major sources of income to all contractors who undertake construction project are interim valuations and related claims. Differences exist between the terms and conditions of a contract for most projects. This is exemplified especially as to which of the parties is responsible for the preparation of interim valuations, the dates for interim valuations, and the minimum amount at interim valuation. Under the conditions of contracts for most projects, the responsibility for preparing such interim valuation is placed on the employer's appointed project manager. The project manager's valuation takes account of any application for payment made by the contractor. The valuation also considers the current forecast of actual construction (which represents the direct cost of materials, labour and plant to execute the project) for the works submitted by the contractor. These interim payments are of critical importance to the contractor's cash flow. Thus, contractors are faced with undertaking interim valuations, usually at monthly intervals or stage evaluation, although this can vary.

The importance of these valuations stems from the fact that they:

- Control the contractor's cash in flow
- Provide financial information for the contractor
- Serve as information on the general progress of the works

According to Navon (1995), the income flow for a typical project is calculated on the basis of cost flow, taking into consideration retention and billing period as

$$I_t = (1 - \frac{R}{100}) x C_{t-b} + M_t$$

Where:

- I_t is the cash inflow (revenue) for time period t,
- R is the retention,
- C_{t-b} is the direct cost for period t-b, b is the billing period and
- M_t is the additional payment determined by the contract.

Contractor's Expenditure Curve

During the production process, the contractor expends on various activities and expects to be reimbursed on the expenses made. This forms what is called 'the cyclic income and expenditure curve' of the contractor. Throughout the active stage of a project, expenditure is an ongoing process which occurs at irregular intervals during the project duration. A plotted expenditure pattern for a typical project which includes the entire direct and indirect cost and head office expenses normally rises or peaks, and then begins to fall, along the trajectory or duration of the project.

Research has however shown that, for most building construction projects, a chunk of the cash out flow is expended directly or indirectly on materials procured, except for capital intensive civil works. Contractors can thus negotiate the billing period with nominated suppliers for the payment of the cost of materials purchased to be deferred until a later date after certificates have been honoured by the client. According to Navon

(1995), the minimum stock level for materials in any firm is given by the formulae

$Q(M_i) = Q_{max}(M_i) - Q_{min}(M_i)$

Where

- Q_{max} is the maximum stock size for material M_i and
- Q_{min} is the minimum stock size for material M_i and
- $Q(M_i)$ is the material to be purchased or ordered.

Research Method

Population

This paper is based on a mix methodological approach of data collection: quantitative and qualitative procedures. With the application of the quantitative data collection, a survey questionnaire was designed and administered to contractors, consultants and clients working on district assembly common fund projects in the two regions. The sample size was determined through the Kish (1965) method from a population size of 26 consultants, 206 contractors and 38 district assemblies in the Ashanti and Brong Ahafo regions of Ghana. A summary of the returned completed questionnaire is shown in table 1 below.

Table 1: Summary of Responses of Questionnaires Sent Out

Respondents	Question-naires out	Response	Percentage response (%)
Consultants	26	22	84.62%
Contractors	88	71	80.68%
District Assemblies	38	30	78.95%
Total	152	123	80.93%

Source: Author's Field Survey

Questionnaire Design and Data Collection

The questionnaires listed 30 factors that could potentially affect the cash flow of contractors for respondents to rate. Respondents were requested to rate the above factors against a five point Likert scale of 1= not important; 2= slightly important; 3=moderately important; 4=very important; and 5=extremely important. All the questionnaires were administered personally to the respondents during which advantage was taken to interview some top and middle level management staff. Respondents were given three weeks to fill the questionnaires after which they were personally collected for analysis. During the period between distribution and collection, respondents were called on phone or e-mailed to remind them of the questionnaires.

Data analysis

The quantitative data was analysed based on the five-point Likert scale ratings provided by the respondents. These ratings were combined to deduce the relative importance indices of the factors based on respondents, after which further analysis were made to compute the overall cash flow factors from the three responses based on the total sample size. Based on analysis of the responses from respondents, ratings of the overall cash flow factors was computed based on the total sample size involving contractors, consultant and clients together. The weightings and relative importance indices of the R_{ax}, R_{bx} and R_{cx} were combined as follows: adding the product of the Relative Importance indices for each

group and adding the product of the proportion of respondents from the corresponding group (as a proportion of the total response)

For example, the overall Ranking Rz for Minimum Amount of Valuation is calculated as follows

$=(((0.68 \times (71/123)) + (0.71 \times (22/123)) + (0.81 \times (30/123))) = 0.716$

Response for contractors is 71, response for consultant is 22 and that for district assemblies is 30 and total response is 123.

The weightings for each factor were computed separately and then used to rank the identified factors in the order of importance as shown in Table 2.

A z-test was conducted at 5% significance level to confirm the significance of each variable on the hypothesis:

Null Hypothesis

- H_o: The variable (factor) has a considerably strong influence. Thus accept factor as significant

Alternate Hypothesis

- H_1: The variable (factor) does not have a considerably strong influence. Thus reject factor as not having significant influence

Based on Table 4, Significance testing was used to decide whether to accept or reject the null Hypothesis, Ho. An evaluation of the test statistics (X) was done and the probability (p-value) of observing a value of the test statistics was also determined. The 'p' value was taken as the smallest value at which the significance level (α) could be present and still have small (lesser than 5% significance level) (Milton and Arnold, 1998).

The sample mean for the data in respect of each factor and the effect of variation are shown in the table 5.9. The 5-point rating (1, 2, 3, 4 and 5) have mean of 3 with a standard deviation of 1.58. The p-value for the test was determined to find out if there was much difference between the null value of μ=3, and the sample means in table 5.9 to cause the rejection of the Ho. The profitability of observing the sample mean or larger $\mu = 3$ and $\sigma = 1.58$ was computed. The test statistics (X) was the central limit theorem, where x is approximately normally distributed with mean $\mu = 3$ and standard deviation, $\sigma/\sqrt{n}$ where n = number of responses for that factor. The p-value was obtained using the relation below.

$$P = (x \geq \mu) = p\left(z \geq \frac{\bar{x} - \mu}{(\sigma/\sqrt{n})}\right)$$

$$= 1 - P\left(z \leq \frac{\bar{x} - \mu}{(\sigma/\sqrt{n})}\right)$$

From the cumulative distribution standard normal table, where $Fz(z) = P[Z \leq z]$, the value of z ranges from -3.9 to 3.9. Any value of z less than -3.9 has a Fz(z) of zero (0) whereas vales of more than 3.9 has Fz(z) of unity (1).

The p- value is the smallest level of significance for which the observed data would call rejection of Ho in favor of H1. The p-value gives additional insight into the strength of the decision taken. Thus a relatively small p-value of 0.001 indicates that there is little likelihood that H_o is true. On the other hand a high p- value such as 0.2033

means that H_o is not rejected and there is little likelihood that it is false.

The p-value is often referred to as the observed level of significance for a given level of significance, α; thus the larger population has a distribution of P~X [μ = 3, σ = 1.58] 7.67

For example the P- value for 'Effective margins' is calculated as follows

$$P[X \geq 4.696], = p\left[\frac{4.63-3}{(0.21/\sqrt{123})}\right]$$

$$P[Z \geq 0.69] = 0.845$$

Since the null hypothesis H_o= 0.05< 0.945, we accept H_o, thus the factor Effective margins' is an important factor affecting contractors cash flow.

For rating to be done based on the total sample size of contractors, consultants and clients, the coefficient of variation (COV) was determined. This was used to determine the relative variability of the responses from the three groups to the factors that affect the cash flow of contactors. A relatively low coefficient of variation indicates that there exists a relatively high agreement between the three respondents. The coefficient of variation expresses the standard deviation of the respondent from each of the three groups as a percentage of the mean (Elhag et al, 2002).

COV = S / X x 100 %
Where
COV= Coefficient of variation
S= standard deviation
X= Weighted mean ranking

The group mean and standard deviations is calculated as shown in table 4 below.

For example COV for Item 6 (rate of retention) is calculated as

COV = S / X x 100 = 0.36 / 4.11 x 100 =

Also the COV for Item 17 (company cash flow) is given as
COV = 0.46 / 1.98 x 100 = 22.94.

The relatively low coefficients of variation deduced in the table above indicates that the responses of the Contractors, Consultants and District Assemblies do not differ much in their rating of the factors that affect the cash flow of Contractors.

Thirdly, to serve as verification to the outcome of the COV and overall rating of the three (3) responses, a concordance test was calculated using Kendal's coefficient of concordance (W). The later is used to measure the degree of agreement by the three judges who rated the factors.

$$W = \frac{S}{1/12(K)^2(N^3-N)}.$$

Where $S = (\sum Ri - \sum Ri / N)^2$
S= standard deviation
Ri = summation of the ranking of the three categories for the respective factor and effects
N= Number of factors
K = Number of categories
W = Kendal's coefficient of concordance

Table 2: Overall Ranking of Factors Affecting the Cash Flow of Contractors'

Item	Factors Affecting Contractors Cash flow	Contractors		Consultants		Dist Assembly		O/A Indx	O/A Rank
		Rel Indx	Rank	Rel Indx	Rank	Rel Indx	Rank		
1	Contractual specification for minimum amount valuation	0.68	15	0.71	16	0.81	14	0.716	14
2	Bank overdraft - (Availability of cash credit facility)	0.83	4	0.79	10	0.92	6	0.842	6
3	Advanced payment	0.70	13	0.77	11	0.86	9	0.749	12
4	Timing interval between two certificates	0.74	9	0.86	5	0.97	2	0.817	4
5	Period of honouring certificates by client	0.88	2	0.80	9	0.99	1	0.889	3
6	Rate of retention	0.79	7	0.84	6	0.89	8	0.822	8
7	Limit of retention	0.71	12	0.73	14	0.77	15	0.727	13
8	Interest rates	0.55	22	0.44	28	0.73	16	0.571	20
9	Degree of variation	0.57	20	0.56	24	0.61	19	0.575	19
10	Withholding tax	0.56	21	0.93	3	0.85	10	0.695	15
11	Effective margins	0.90	1	0.97	1	0.97	3	0.927	1
12	Overheads	0.73	10	0.76	12	0.83	13	0.759	10
13	Pricing strategy (front end loading and back end loading,)	0.82	5	0.91	4	0.93	4	0.860	5
14	Over measurement and under measurements	0.86	3	0.95	2	0.92	5	0.891	2
15	Delay in paying creditors (material suppliers and plant hirers)	0.80	6	0.82	8	0.85	11	0.818	7
16	Quality of measurement accuracy in valuation	0.69	14	0.64	21	0.53	23	0.642	16
17	Company Cash flow	0.28	29	0.57	23	0.55	22	0.396	29
18	Economic instability / Price Instability	0.66	16	0.65	20	0.59	20	0.639	17
19	Contract type (fixed, cost plus, etc)	0.47	23	0.39	29	0.36	28	0.428	27
20	Poor site management	0.42	27	0.59	22	0.47	25	0.463	25
21	Experience of contractor and level of mistakes during construction	0.36	28	0.49	25	0.42	26	0.398	28
22	Poor supervision	0.45	25	0.45	26	0.39	27	0.431	26
23	Cost overruns	0.46	24	0.72	15	0.63	17	0.546	21
24	Number of projects being handled by the firm	0.43	26	0.67	19	0.57	21	0.508	23
25	Sub -contractors retention held by main contractor	0.60	18	0.45	27	0.28	28	0.496	24
26	Discount on material purchased	0.72	11	0.75	13	0.84	12	0.752	11
27	Value of preliminaries	0.77	8	0.82	7	0.90	7	0.811	9
28	Material on site	0.59	19	0.68	18	0.28	29	0.530	22
29	Material in transit	0.25	30	0.27	30	0.20	30	0.239	30
30	Time over-runs	0.61	17	0.69	17	0.61	18	0.624	18

Source: Author's Field Survey

TABLE 3 Concordance Testing of Factors Affecting Contractor's Cash Flow

Item	Factors Affecting Contractors Cash Flow	Contractors Rank	Consultants Rank	Assembly Rank	Ri	Ri-(Ri/N)	Ri-(Ri/N)
1	Contractual specification for minimum amount valuation	15	16	14	41	-4.97	24.67
2	Bank overdraft- (Availability of cash credit facility)	4	10	6	25	-20.97	439.60
3	Advanced Payment	13	11	2	29	-16.97	287.87
4	Timing interval between two certificates	9	5	1	23	-22.97	527.47
5	Period of honouring certificates by client	2	9	9	17	-28.97	839.07
6	Rate of retention	7	6	8	27	-18.97	359.73
7	Limit of retention	12	14	15	54	8.03	64.53
8	Interest rates	22	28	16	74	28.03	785.87
9	Degree of variation	20	24	19	47	1.03	1.07
10	Withholding tax	21	3	10	25	-20.97	439.60
11	Effective margins	1	1	3	14	-31.97	1021.87
12	Overheads	10	12	13	26	-19.97	398.67
13	Pricing strategy (front end loading and back end loading,)	5	4	4	11	-34.97	1222.67
14	Over measurement and under measurements	3	2	5	13	-32.97	1086.80
15	Delay in paying creditors (material suppliers and plant hirers)	6	8	11	35	-10.97	120.27
16	Quality of measurement accuracy in valuation	14	21	23	58	12.03	144.80
17	Company cash flow	29	23	22	72	26.03	677.73
18	Economic instability / Price instability	16	20	20	65	19.03	362.27
19	Contract type (fixed, cost plus, etc)	23	29	28	74	28.03	785.87
20	Poor Site management	27	22	25	74	28.03	785.87
21	Experience of contractor and level of mistakes during construction	28	25	26	79	33.03	1091.20
22	Poor supervision	25	26	27	66	20.03	401.33
23	Cost overruns	24	15	17	58	12.03	144.80
24	Number of projects being handled by the firm	26	19	21	72	26.03	677.73
25	Sub Contractors retention held by main contractor	18	27	28	58	12.03	144.80
26	Discount on material purchased	11	13	12	31	-14.97	224.00
27	Value of preliminaries	8	7	7	33	-12.97	168.13
28	Material on site	19	18	29	67	21.03	442.40
29	Material in transit	30	30	30	77	31.03	963.07
30	Time over-runs	17	17	18	34	-11.97	143.20

Source: Author's Field Survey

TABLE 4: Significance Testing Of Factors Affecting Contractors Cashflow

Item	Factors Affecting Contractors Cash Flow	Mean	Standard Dev.	Coeff of variation.	Weighted (Raz)	P-value	Acceptance or rejection
1	Contractual Specification for minimum amount valuation	3.59	0.58	16.08	0.72	0.09	A
2	Bank overdraft- (Availability of cash credit facility)	4.21	0.39	9.32	0.84	0.28	A
3	Advanced Payment	3.75	0.48	12.71	0.75	0.14	A
4	Timing interval between two certificates	4.09	0.57	13.92	0.82	0.17	A
5	Period of honouring certificates by client	4.45	0.27	6.07	0.89	0.48	A
6	Rate of retention	4.11	0.36	8.74	0.82	0.28	A
7	Limit of retention	3.63	0.43	11.92	0.73	0.13	A
8	Interest rates	2.86	0.70	24.52	0.57	0.00	R
9	Degree of variation	2.88	0.60	20.79	0.58	0.00	R
10	Withholding tax	3.48	0.92	26.48	0.69	0.05	A
11	Effective margins	4.63	0.21	4.61	0.93	0.69	A
12	Overheads	3.80	0.41	10.70	0.76	0.18	A
13	Pricing strategy (front end loading and back end loading,)	4.30	0.41	9.44	0.86	0.29	A
14	Over measurement and under measurements	4.46	0.27	6.07	0.89	0.49	A
15	Delay in paying creditors (material suppliers and plant hirers)	4.09	0.37	8.95	0.82	0.27	A
16	Quality of measurement accuracy in valuation	3.20	0.59	18.52	0.64	0.03	A
17	Company cash flow	1.98	0.46	22.94	0.40	0.00	R
18	Economic instability / Price instability	3.20	0.58	18.23	0.64	0.03	A
19	Contract type (fixed, cost plus, etc)	2.14	0.50	23.32	0.43	0.00	R
20	Poor Site management	2.32	0.46	19.76	0.46	0.00	R
21	Experience of contractor and level of mistakes during construction	1.99	0.43	21.43	0.40	0.00	R
22	Poor Supervision	2.15	0.36	16.62	0.43	0.00	R
23	Cost Overruns	2.73	0.66	24.13	0.55	0.00	R
24	Number of projects being handled by the firm	2.54	0.50	19.57	0.51	0.00	R
25	Sub-contractors retention held by main contractor	2.47	0.92	37.28	0.50	0.00	R
26	Discount on material purchased	3.80	0.41	10.70	0.75	0.18	A
27	Value of preliminaries	4.06	0.39	9.68	0.81	0.24	A
28	Material on site	2.64	0.96	36.35	0.53	0.00	R
29	Material in transit	1.20	0.10	8.61	0.24	0.00	R
30	Time over-runs	3.12	0.70	22.55	0.62	0.02	A

Source: Author's Field Survey

Table 5B: Combined Overall Rating Of Factors Affecting Cash Flow Of Contractors

ITEM	FACTORS AFFECTING CONTRACTORS CASHFLOW	Mode	Mode Freq	Rating < Mod Freq	Rating > Mod Freq	Mode <= Mod freq	Total Reponses	Mode %	%Rating < Mod Freq	%Rating > Mod Freq	%Mode <= Mod freq	Mean	Average Deviation	Interprt of Mode	Rel Imp Indx	Rank	p-value
1	Contractual Specification for minimum amount valuation	4	39	47	58	86	105	0.371	0.448	0.552	0.819	3.505	0.833	VR	4.907	14	0.970
2	Bank overdraft- (Availability of cash credit facility)	5	47	74	31	105	105	0.448	0.705	0.295	1.000	4.143	0.803	HR	5.800	5	1.290
3	Advanced Payment	3	36	12	93	48	105	0.343	0.114	0.886	0.457	3.714	0.823	RR	5.200	11	1.160
4	Timing interval between two certificates	4	38	23	82	67	105	0.362	0.219	0.781	0.638	3.971	0.811	VR	5.560	9	1.190
5	Period of honouring certificates by client	5	49	67	38	105	105	0.467	0.638	0.362	1.000	4.295	0.795	HR	6.013	3	1.390
6	Rate of Retention	5	40	67	37	104	104	0.385	0.644	0.356	1.000	4.057	0.797	HR	5.680	6	1.230
7	Limit of retention	3	40	12	93	52	105	0.381	0.114	0.886	0.495	3.600	0.829	RR	5.040	13	1.010
8	Interest rates	2	36	14	91	50	105	0.343	0.133	0.867	0.476	2.733	0.870	RR	3.827	21	0.710
9	Degree of variation	3	44	34	71	78	105	0.419	0.324	0.676	0.743	2.876	0.863	RR	4.027	19	3.600
10	Withholding tax	4	29	49	56	78	105	0.276	0.467	0.533	0.743	3.343	0.841	VR	4.680	15	1.225
11	Effective margins	5	72	78	27	105	105	0.686	0.743	0.257	1.000	4.600	0.781	HR	6.440	1	2.600
12	Overheads	4	39	42	63	81	105	0.371	0.400	0.600	0.771	3.733	0.822	VR	5.227	12	1.175
13	Pricing strategy (front end loading and back end loading,)	5	54	75	30	105	105	0.514	0.714	0.286	1.000	4.248	0.798	HR	5.947	4	1.360
14	Over measurement and under measurements	5	59	70	35	105	105	0.562	0.667	0.333	1.000	4.429	0.789	HR	6.200	2	1.500
15	Time Internal between cost commitment	5	40	65	40	105	105	0.381	0.619	0.381	1.000	4.057	0.807	HR	5.680	7	1.240
16	Quality of measurement accuracy in valuation	4	33	57	48	90	105	0.314	0.543	0.457	0.857	3.295	0.843	VR	4.613	16	0.890
17	Company Cash flow	1	46	0	105	46	105	0.438	0.000	1.000	0.438	1.857	0.912	IR	2.600	29	0.480
18	Economic Instability / Price Instability	3	39	24	81	9	105	0.371	0.229	0.771	0.086	3.238	0.846	RR	4.533	17	0.870
19	Contract type (fixed, cost plus, etc)	2	32	32	73	64	105	0.305	0.305	0.695	0.610	2.200	0.895	RR	3.080	27	0.660
20	Poor Site management	2	36	25	80	61	105	0.343	0.238	0.762	0.581	2.314	0.890	RR	3.240	25	0.690
21	Experience of Contractor	1	40	0	105	40	105	0.381	0.000	1.000	0.381	1.971	0.906	IR	2.760	28	0.500

Authors' Field Survey

Table 25: Combined Overall Rating of Factors Affecting Cash Flow of Contractors

ITEM	FACTORS AFFECTING CONTRACTORS CASHFLOW	Mode	Mode Freq	Rating < Mod Freq	Rating > Mod Freq	Mode <= Mod freq	Total Reponses	Mode %	%Rating < Mod Freq	%Rating > Mod Freq	%Mode <= Mod freq	Mean	Average Deviation	Interprt of Mode	Rel Imp Indx	Rank	p-value
22	Poor Supervision	2	39	25	80	64	105	0.371	0.238	0.762	0.610	2.190	0.896	RR	3.067	26	0.560
23	Cost Overruns	3	27	47	58	74	105	0.257	0.448	0.552	0.705	2.657	0.873	RR	3.720	22	0.720
24	Number of projects being handled by the firm	3	38	52	53	90	105	0.362	0.495	0.505	0.857	2.495	0.881	RR	3.493	24	0.740
25	Sub Contractors retention held by main Contractor	1	30	0	105	30	105	0.286	0.000	1.000	0.286	2.657	0.873	IR	3.720	23	0.685
26	Discount on material purchased	4	34	45	60	79	105	0.324	0.429	0.571	0.752	3.695	0.824	VR	5.173	12	1.150
27	Value of Preliminaries	5	41	64	41	105	105	0.390	0.610	0.390	1.000	3.981	0.810	HR	5.573	8	1.200
28	Material On site	2	31	19	86	50	105	0.295	0.181	0.819	0.476	2.857	0.864	RR	4.000	20	0.750
29	Material in transit	1	84	0	105	84	105	0.800	0.000	1.000	0.800	1.229	0.941	IR	1.720	30	0.340
30	Time over-runs	4	33	59	46	92	105	0.314	0.562	0.438	0.876	3.133	0.851	VR	4.387	18	0.835

Authors' Field Survey

The value of w ranges between -1 to +1 inclusive. A 'w' value of approaching +1 indicates a strong concordance between s and w whereas a 'w' value of approaching -1 indicates a non-concordance. Find below the concordance test for factors affecting contractor's cash flow as shown in Table 3 which is calculated as follows

$$\sum Ri = 1379$$

$$\sum \frac{Ri}{N} = \frac{1379}{30} = 45.96$$

$$S = (\sum Ri - \sum Ri / N)^2 = 14776.97$$

$$W = \frac{S}{1/12(K)^2(N^3 - N)}$$

$$W = \frac{14776.97}{1/12(3)2\,(303-30)}$$

$$W = 0.731$$

A Kendal's rank correlation of 0.731 was measured which indicates a strong concordance between the responses of the contractors, consultants and the district assemblies in terms of their choice of the factors that affected the cash flow of contractors who undertook construction projects.

Finally, in order to prove the authenticity of the above analysis, a test of hypothesis using the Chi square distribution was used. At 95% level of significance, using the relationship:

H_0= there is a disagreement between the three groups in ranking the factors that affect the cash flow of Contractors,

H_1= there is no disagreement between the three group in ranking of factor that affected the cash flow of contractors

At 95% level of significance, using the relationship:

$$X2 = k\,(N-1)\,w$$

$$X2 = 3(30-1)\,0.731$$

$$X2 = 63.55 > 45$$

Where N-1 indicates the degree of freedom. At the chosen level of significance, the decision to accept or reject the null hypothesis is based on the largest value for the acceptance read from the Chi-square tables. The largest value for the acceptance of the null hypothesis is 45. The null hypothesis is therefore rejected, implying there is agreement between the three groups.

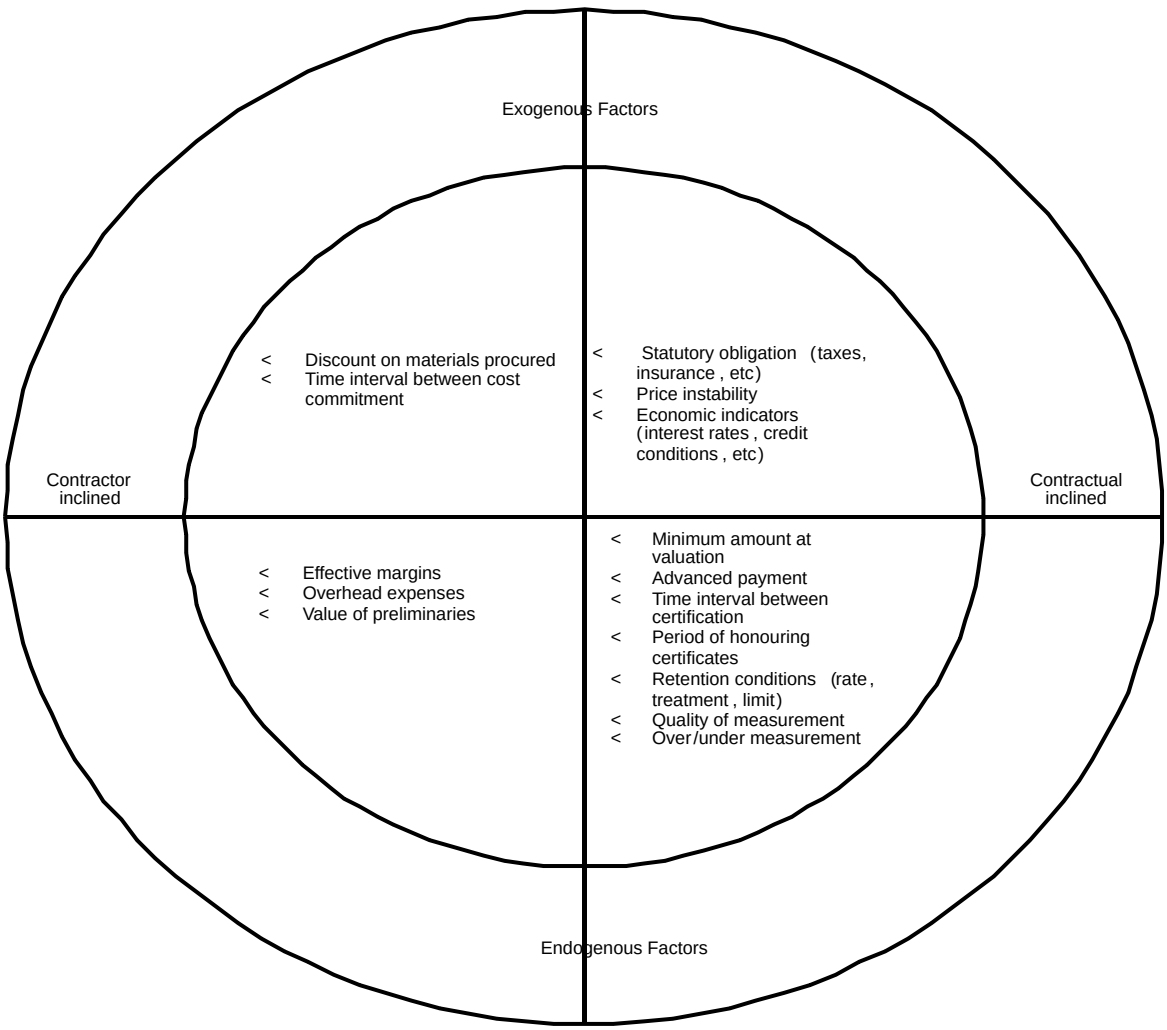
Using central tendency dispersion (mean, mode, mean deviation, and relative importance indices), table 5a and 5b analyses the combined overall ratings. Thus the first 15 factors selected has a modal rating of 3 and above with very high modal frequency. It would be observed that findings from table 2, 4 and 5 were coherently consistent and revealed 15 to 17 factors are significant, to be considered when managing cash on construction projects in Ghana.

Discussions

Based on the above analysis from the field survey, 17 factors were identified as the most significant factors affecting Contractor's cash flow in their ranking order. Retention related factors (rate, limit and treatment) were treated as one factor resulting in 15 significant factors. These 15 factors had a P-value greater than zero from the significant testing in table 4. These 15 factors were re-organised into three generic groupings: monetary, schedule and general factors based on essential characteristics of the factor.

A critical review of the conceptual cash flow factors in figure 1 indicates that factors can be classified as endogenous or exogenous factors. Endogenous factors are perceived to be directly within the control and purview of the project domain. These can be initiated, influenced or controlled by the the contractor or the client through the contractual terms impliedly inserted by his authorized representative. These Endogenous factors are depicted in quadrant 3 and 4. Factors depicted in quadrant 3 are directly controlled by the client or contract conditions and are beyond moderation of the contractor.

Figure1:Factors affecting contractor's cash flow



Source: Authors' Construct

Factors depicted in quadrant 4 are endogenous factors within the control of the contractor during tendering. A realistic assessment of these costs by the contractor goes a long way to enhance his cash flow during the construction stage.

The model further classifies factors beyond the domain of the contractor and the client as exogenous factors. Exogenous factors in quadrant 1 can however be negotiated by the contractor to result in enhanced cash flow factors. These directly result from procurement of materials and arrangement with creditors. Arrangement can be made with creditors and plant hirers to extend the debt conversion period resulting in using decreasing cash outflow and using existing scarce resources for immediate pressing procurement which cannot be credited.

Cash flow factors in the second quadrant are exogenous in nature and beyond the control of the contractor and client rather initiated by the current economic indicators. These factors such as inflation, price instability and economic indicators are dictated by the local and global economic conditions. Though some of the factors are exogenous and endogenous, these factors can further be classified generically as monetary related, schedule related or general factors based on characteristics of the factor and its direct effect on the cash flow of the contractor. Knowledge about these factors enables the contractor plan for possible difficult times ahead of the construction process.

Conclusions

Since the nature of the construction industry makes the operation in the industry such that firms work on their given projects to an appreciable level for later reimbursement of the work done based on the terms of the contracts, the economics of project has to be critically studied to prevent capital lock-up. Most contractors working on construction projects in Ghana suffer seriously from liquidity and cash flow problems. The effects of the above cash flow problem result in undue delay in project completion with its rippling effect of construction cost and time overruns. The above situation is compounded when such projects are fixed price in nature without fluctuation as part of the contract. The knowledge of the economics of a project at the pre-contract stage is critical to deciding whether or not to tender and to ensure an efficient cash flow management at all times during the contract period. In most developing countries like Ghana the government is the major financier of infrastructural projects saddled with the average annual budget deficit of about 8-12%. This situation makes all national projects scramble for the limited national resource available making it very difficult for contractor's cash flow problems to be solved.

Based on the above study, it has been observed that the very important factors that affect the cash flow of contractors on construction projects can be categorized into exogenous and endogenous factors with some factors directly influenced by the client, others influenced by the contractors and others influenced by the global economic conditions. There is hence the need for both the client and the contractor to balance the exogenous and endogenous factors to manage the challenges resulting in cash flow deficit. The client through his authorized representative must endeavour to minimise the extent to which conditions in quadrant 3 are flouted such as

under measurement, errors in measurement, delay in releasing retention, extensive delays in honouring certificates and erroneous floor limits for valuation. This enables the contractor live up to expectation and makes his business more profitable.

The contractor, at the tendering stage should endeavour to use realistic margins deduced through risk analysis, properly assessed preliminaries and overheads expenses since a poor assessment of these factors affect his cash flow situation.

Limitations

The research is a preliminary exploratory study that highlights issues concerned with the cashflow of a contractor. Primary data collected was practically limited to building construction project information from two stratified regions in Ghana (Ashanti and Brong Ahafo regions) based on the dominant traditional procurement method in Ghana.

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