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TOWARDS EFFECTIVE CLIENT PROCUREMENT: ASSESSING CONTRACTOR RISK WITH FINANCIAL RATIOS

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Abstract

Evaluation of the contractor by client organisations forms a very crucial part of the client's procurement strategy for construction services. Current practice in undertaking such an evaluation often employs factors that are directly project-related. More important in this regard is the overriding influence of the tender price as a criterion for contractor selection. In the prevailing business climate within construction, the need for such an evaluation to take on board the susceptibility of the contractor's whole organisation to financial insolvency is apparent. This should allow for a clear awareness of the risk of engaging the services of a particular contractor by the client. The paper reviews various financial measures and tools that have been developed, or found application in the risk evaluation of enterprises. It puts forward a case for the incorporation of some of these tools in assessing the overall risk associated with the client's engagement of the services of a particular contractor.

Keywords procurement, contractor. client. ratio models. insolvency

INTRODUCTION

Construction procurement in a very broad sense encompasses the variety of activities needed to acquire the design, management and installation of required inputs to ensure the complete delivery of construction projects for clients (Yates, 1991; Franks 1990). The fragmented responsibility for the design and the implementation of the designs, combines with the uniqueness of construction projects to create an industry environment where the choice of a system for procurement is diverse and often complex. A fundamental activity involved in this complex process is the selection of appropriate contractors to implement the project. This may occur at the early stages of the project or after the project is advanced appreciably, depending on the procurement system adopted. It is essential that the client's decision regarding the selection of contractor is done on a *get-it-right-the-first-time* basis. The impact of getting this activity wrong for procuring construction can range from a litigious climate for

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the project, to the possibility of contractor bankruptcy. The cost of selecting the wrong contractor can, therefore, be immense to the client. To obviate these possible adverse consequences, this paper proposes that bankruptcy risk of contractors that deliver the client's facility should form a crucial part of the selection criteria.

The paper first discusses construction procurement as an investment activity of the client, and reviews the conventional criteria that are employed by clients in the selection of the organisations to fulfil this venture. It makes a case for the inclusion of contractor bankruptcy potential in the selection criteria to reduce the risks borne by the client. Various approaches for undertaking this evaluation of bankruptcy potential with financial ratios are presented, from which client organisations can learn.

CONSTRUCTION PROCUREMENT AS CLIENT INVESTMENT

The greatest proportion of clients engage in primary business activity not directly related to construction. Their investment in construction is often a one-off experience which involves a relatively huge investment in a physical asset, with substantial capital outlay by the client prior to the delivery of the conceived facility. This takes the form of stage payments to the service providers and can result in locked up capital for the client over a considerable period of time. The size of such an investment usually has strategic consequences for the client's organisation. This naturally exposes the client to substantial risks. A significant proportion of this investment risk is managed through the application of contractual conditions. Latham (1994) provides several important suggestions for addressing these contractual relationships to benefit all the participants of the industry's supply-chain. However, it has to be emphasised that such contractual conditions do not eliminate the client's risks altogether, but only ensures that they are mitigated.

Client options for procurement

Of equal importance in managing these risks is the system of procurement for delivering the project. The various options for procuring these services were categorised by Masterman (1992) to include *separated* and *integrated* systems, depending on the project management structure that culminates.

In the *separated* system, responsibility for the design and its eventual implementation are undertaken by several organisations operating from different establishments, but who act in close co-operation to achieve the project. Typical examples of this system of procurement include the *open competitive* and *selective tendering*, as well as most *negotiated* and *serial contracts*. Their major characteristic is that the project delivery progresses as a sequential process, whereby the design is largely completed before work commences on its implementation. Responsibility for managing these two phases is divided between establishments appointed by the client to act as consultants and contractors. Craig and Davenport (1996) describe various factors that should facilitate the selection of contractors for the various *separated systems*. The administration of the *separated systems* however, is often characterised by disputes which increases client risk for projects (Conlin et al., 1996).

The evolution of *integrated* systems, whereby the design and its implementation are retained under the managerial responsibility of a single corporate establishment is a motivation of having a one-stop shop for the client. Examples of these *integrated* systems include the *design and build*, *turnkey*, and *build-own-operate-transfer* contracts. The single point responsibility of these systems, whilst having the potential to reduce disputes, increases the client's risk regarding contractor bankruptcy. In recent times the need to minimise the client's risks in procuring construction facilities has led to alternative forms of such integrated systems such as *partnering*. The requirement of *'openness and trust'* that is supposed to characterise this voluntary and flexible procurement method has the capacity to minimise the client's risks for the project. In practice however, clients need to establish that such open relationship is entered into with establishments that are not potential bankrupt organisations within the foreseeable future.

CLIENT SELECTION CRITERIA

The contractors selected to undertake this investment are as important as the contractual conditions and other arrangements adopted to manage the client's risks. Irrespective of the system adopted by the client, there are certain features that normally drive the selection of a particular organisation to deliver some or all the activities of the procurement process. The client's criteria often centre on three functions: time, cost, and quality that contractors associate with the proposed project. According to Masterman (1992), these requirements are normally expressed as:

- value for money;
- avoidance of latent defects;
- reasonable maintenance and running costs;
- durability of the facility;
- contractor performance on previous projects regarding time, cost and quality;
- ability to maintain a harmonious business relationship; and
- minimising the client's liability during the project.

The orientation of the client's criteria outlined above is centred on projects. This in itself is very useful. However, the absence or little emphasis placed on the long-term financial viability of the contractor could in some cases prove quite costly, and provides the rationale for utilising bankruptcy evaluation for contractor selection.

Need for long-term contractor evaluation for major projects

Construction has always experienced a relatively high proportion of insolvency compared to the rest of the general economy. In recent times the decline in orders for the industry, as a consequence of the recent global recession, has escalated competition, with record levels of corporate collapses in the industry (Thorpe and McCaffer, 1991). Construction clients need to become more attuned, in such a high risk industry, to the potential for failure of the companies whose services they engage, for which recent events have shown that no organisation can be excluded. This could be accomplished primarily through the application of financial evaluations among other factors.

The incorporation of bid and performance bonds in most international contracts seek to minimise clients' exposure to such risks. These are underwritten by commercial banks and insurance companies. The criteria employed by the financial institutions as a basis for taking on the contractor's liability focus not only on the project specific characteristics, but also encompass the long-term financial viability of the contractor. Their decision to provide the guarantees required by the conditions of the bonds are driven more by the financial stability of the contractor. Their approach presents a good example which should inform the way construction clients evaluate the contractors who undertake their projects.

ENHANCING CONTRACTOR SELECTION WITH BANKRUPTCY EVALUATIONS

The conventional method for predicting the tendency of a contractor becoming insolvent rely on the signals generated by its financial ratios. This are normally undertaken by applying a single ratio measure in isolation. Its inadequacy for providing accurate predictions has led to the emergence of ratio models and other composite ratio measures developed to overcome the weaknesses inherent in the application of single ratios (Inman, 1991). The ratio models have been developed for application in both construction and non-construction industries. The primary motivation for applying such models to the construction industry is to minimise risk for client organisations and corporate lending institutions that usually have a direct business relationship with construction companies (Edum-Fotwe et al., 1995). The next section outlines examples of bankruptcy evaluation methods that have found application both in construction and non-construction industries.

Bankruptcy evaluation methods

Subjective index

The subjective index method employs an expert's perception of an acceptable level for the financial figures of a company, to derive a composite measure of its performance and potential for continued financial stability. These methods are generally applied by corporate lending institutions that have to assess overdraft and bond applications by construction companies.

A notable example in this category is the index of risk approach. This utilises a subjective assessment of a combination of several relevant financial ratios to assess the vulnerability of a company to possible insolvency and hence disqualification for credit. The original concept was developed by Tamari (1978). This work identified the ratios listed in Table 1 as those considered by executives of credit-granting institutions to be relevant, for assessing applicant companies. Table 1 also presents the maximum subjective weighting associated with each of the ratio variables for deriving the index of risk. The Tamari index was composed of two types of variables. The first type comprised the first three ratios in Table 1, and measured the absolute performance of the company. The second type utilised the next three ratios in Table 1, and evaluated the relative standing of a company with respect to other companies in its market sector. A company is allocated points for each variable for these last three variables, based on the statistical distribution of its counterpart ratio value within the

population of its category of companies. Table 2, 3 and 4 present the subjective point system of Tamari to evaluate a company for each ratio variable in the index of risk. To apply the risk of index approach, a company is evaluated for each variable, based on the classification ranges in Tables 2, 3 and 4. The points for the individual variables are then aggregated to obtain the index for the company. The maximum aggregated points for any company is 100. A high index or score of aggregated points, indicates a favourable financial standing, less susceptibility to bankruptcy, and hence less risk for the client. The mean

Table 1. Index of Risk Assessment

RATIO	MAXIMUM POINTS	POINTS AWARDED
Equity as a ratio of total funds	25	
Profits trend to value of production over 3 years	25	
Current ratio	20	
Value of production to inventory	10	
Sales to trade receivable	10	
Value of production to working capital	10	
Total [index -I]	**100**	

Table 2. Subjective point system equity as a percentage of total funds

Ratio	R value (%)	Corresponding points
Equity as a ratio of total funds	R > 50	25
	40 < R < 50	20
	30 < R < 40	15
	20 < R < 30	10
	10 < R < 20	5
	R < 10	0

R represents ratio value for company

Table 3. Subjective point system: trend of profits and current ratio

Ratio	R value measure	Equivalent points
3-year trend of profits/value of production) Current ratio)	Uniform annual rise in profits	25
	Non-uniform annual rise in profit	20
	Profits every year but declining trend	15
	Loss in year 1 followed by profits	15
	Loss in a year other than the first	10
	Loss in the first and second years	5
	Loss in all three, or the last two years	0

R represents ratio value for company

Table 4. Subjective point system: strategic group assessment

Ratio	R value for strategic group	Corresponding points
Value of production to inventory)	Upper quartile	10
Sales to trade receivable)	Second quartile	6
Value of production to working capital)	Third quartile	3
	Lowest quartile	0

R represents ratio value for company

position of the index of risk. 50. represents the position of the average company. Companies scoring less than 50 are considered as potential bankruptcy establishments. It has been argued by Edum-Fotwe et al. (1995). that standardising the subjective assessment for particular industries can provide a greater scope for its acceptance.

Ratio Models

Ratio models are of a more sophisticated nature. They combine a number of single ratios in multivariate analysis to establish mathematical relationships for predicting a safe level above which a company's performance is considered as acceptable. The use of these ratio models to determine chances of survival for a company. has been of considerable interest to researchers in both general business (Edmister. 1972; Altman. 1983; Taffler, 1983), and the construction sector alike (Mason and Harris, 1979: Abidali. 1990; Russell and Jaselski, 1992).

I. Non-construction ratio models

Perhaps the most popular of these models is the one developed by Altman (1983) who employed a multivariate technique to establish a prediction model with financial ratios. His model utilised data drawn from large US companies outside the construction industry. The combination of several weighted financial ratios yielded a single index (Z-Score), which classified companies as failing, at risk, or non-failing. Because of the large number of variables found to be significant indicators of corporate financial problems in previous analyses, Altman (1983) employed twenty-two ratios considered as potentially helpful variables for the purpose. Five ratios were emerged as the best predictors of bankruptcy. His analysis produced the composite model:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5 \qquad \text{Eqn-1}$$

where:
X_1 = working capital / total assets;
X_2 = retained earnings since inception / total assets;
X_3 = earnings before taxes and interest / total assets:
X_4 = market value of equity / book value of total debt: and
X_5 = turnover / total assets.

Accordingly, companies were classified as: Z< 1.8: certainty of imminent failure; 1.8 <Z< 2.7: 'grey area', where companies were deemed to be at risk; and Z> 2.7: long term solvency. Taffler (1983) utilised data from British companies, and developed a four-variable Z-score model in the following form:

$$Z = 0.53X_1 + 0.13X_2 + 0.18X_3 + 0.16X_4 \qquad \text{Eqn-2}$$

where:
X_1 = profit before tax / current liabilities;
X_2 = current assets / total liabilities;
X_3 = current liabilities / total assets; and
X_4 = turnover / total assets.

Taffler (1983) suggested a score in excess 0.2 as being characteristic of a company with good long-term survival prospects. A company scoring below zero was regarded as exhibiting the same characteristics as companies that had already failed.

Edmister (1972) conducted a similar analysis for small businesses, initially utilising a list of 19 financial ratios. Edmister concluded that a single financial function was inadequate to classify small businesses, and that a number of analyses should be combined to discriminate effectively between sound and potentially failing business. Accordingly, Edmister outlined the five methods listed below for the analysis, which are applied individually to each of the 19 ratios. He concluded that at least three such methods were required to effectively predict solvency or insolvency for small businesses. The potential for confusion as a result of the complexity arising from analysing that many ratios with each of the five methods is quite obvious.

- Level of the basic ratio.
- Trend of the ratio over a three year period.
- Three-year averages of the ratio.
- Combination of the ratio's trend and the most recent level.
- Relative level and relative trend compared to industry averages.

Robertson (1984) developed a ratio model which was supposed to have general applicability to all industries. He affirmed that there were *a priori* determinants of corporate failure from their financial ratios. Ratios exhibiting such predictive characteristics were employed. His model, presented as Equation-3. combined five ratio variables. The rationale of a ratio model applicable to all industries assumes that the level for each of the ratio variables in the model should be the same for the commencement of bankruptcy in all industries. This argument overlooks the contribution of industry-specific factors to a company's financial performance.

$$Z = 0.3X_1 + 3.0X_2 + 0.6X_3 + 0.3X_4 + 0.3X_5 \qquad \text{Eqn-3}$$

where:
X_1 = (Turnover - Total Assets) / Turnover;
X_2 = Profit before tax / Total Assets;

X_3 = (Current Assets-Total Debt) / Current Liabilities;
X_4 = (Equity-Total Borrowings) / Total Debt; and
X_5 = (Liquid Assets-Bank Overdraft) / Creditors.

II. Construction specific models

The foregoing models were developed generally for other industries. Mason and Harris (1979) developed a six-variable model specifically for the construction industry. Their model was established with a multiple regression approach and presented as:

$$Z = 25.4 - 51.2X_1 + 87.8X_2 - 4.8X_3 - 14.5X_4 - 9.1X_5 - 4.5X_6 \qquad \text{Eqn-4}$$

where:
X_1 = profit before tax and interest / opening balance sheet net assets;
X_2 = profit before tax / opening balance sheet net capital employed;
X_3 = debtors / creditors;
X_4 = current liabilities / current assets;
X_5 = (days debtors); and
X_6 = creditors trend measurement.

A positive Z-score is indicative of long-term solvency whilst a company with a negative value was classified as being potentially insolvent.

Abidali (1990) developed a Z-score model to be used when vetting construction companies on tender lists, and ended up with a seven variable model. He suggested a score of 2.94, as the least value for long-term solvency to be used in his model, which was expressed as:

$$Z = 14.6 + 82.0X_1 - 14.5X_2 + 2.5X_3 - 1.2X_4 + 3.55X_5 - 3.55X_6 - 3.0X_7 \qquad \text{Eqn-5}$$

where:
X_1 = profit after tax and interest / net capital employed;
X_2 = current assets / net assets;
X_3 = turnover / net assets;
X_4 = short term loans / profit before tax and interest;
X_5 = tax trend over three years;
X_6 = profit after tax trend over three years; and
X_7 = short term loan trend over three years.

Abidali (1990) equally recognised the inadequacy of single spot values as absolute measures of future solvency, and recommended that his model should only be used to gauge the financial health of a company when combined with other social, economic and managerial factors.

A multiple model approach was adopted by Edum-Fotwe et al. (1995) for bankruptcy evaluation. This was based on the concept of *different phases of contractors' financial profile*, and developed as a series of functions. It incorporated three linear discriminant

equations of annual ratio differences (Z_d), three-year averages (Z_a), and the basic ratios (Z_b), in the form shown below.

$$Z_d = 0.587X_{d1} + 0.910X_{d2} - 1.154X_{d3} + 0.576X_{d4} + 0.130X_{d5} \qquad \text{Eqn-6.1}$$

where the variables are annual differences of the appropriate ratio values:
X_{d1} = EXP(Liquidity Ratio);
X_{d2} = EXP(Net Worth / Total Assets);
X_{d3} = LN([Working Capital / Total Assets] + 1);
X_{d4} = EXP(Profit after tax / Total Assets);
X_{d5} = Total Asset Turnover.

$$Z_a = 0.454X_{a1} - 0.562X_{a2} - 0.001X_{a3} + 0.352X_{a4} + 0.869X_{a5} \qquad \text{Eqn-6.2}$$

where the variables are three-year averages of the appropriate ratio values:
X_{a1} = LN(Liquidity ratio);
X_{a2} = Net Worth / Total Assets;
X_{a3} = Working Capital / Total Assets;
X_{a4} = SQRT([Profit after tax / Total Assets] + 1);
X_{a5} = Total Asset Turnover.

$$Z_b = -0.359X_{b1} + 0.007X_{b2} - 0.352X_{b3} + 1.091X_{b4} + 0.729X_{b5} \qquad \text{Eqn-6.3}$$

where the variables are values of basic ratios expressed in the form of a decimal:
X_{b1} = LN(Liquidity ratio);
X_{b2} = LN([Net Worth / Total Assets] + 1);
X_{b3} = LN([Working Capital / Total Assets] + 1);
X_{b4} = Profit after tax / Total Assets;
X_{b5} = Total Asset Turnover.

Table 5 presents the corresponding cut-off points for the three functions. A company is evaluated with the model by applying the three functions, and comparing the result with the evaluation options in Table 6.

Table 5. Cut-off scores for classifying with multiple model

Discriminant function	Minimum cut-off	Maximum cut-off
Annual Differences-Z_d	1.8	2.0
3-Year Averages-Z_a	1.5	2.4
Basic Ratios-Z_b	2.2	3.4

Table 6. Evaluation options for multiple model

Difference	Average	Basic	Evaluation
+	+	+	Financially sound phase
-	+	+	Starting phase of failure
-	-	+	Intervening phase of failure
+	-	+	Intervening phase of failure
-	+	-	Intervening phase of failure
+	+	-	Intervening phase of failure
+	-	-	Final phase of failure
-	-	-	Final phase of failure

+ > *maximum cut-off point value*, - < *minimum cut-off point value*

CONCLUSION

The need for comprehensive evaluation of contractors as a basis for their selection cannot be over-emphasised. Conventionally, this is undertaken by utilising project related criteria. The extent of the risk to the client of a contractor going bankrupt, however, provides a compelling argument for the inclusion of the potential for such an event in the evaluation. The methods for undertaking bankruptcy evaluation rely on financial ratios among other factors. Examples of the models developed for such evaluation have been presented, to provide the construction client with options to undertake the assessment. Combined with the well accepted criteria of project time, cost, and quality, the evaluation of bankruptcy potential can facilitate improved client decision-making at the tender stage. This will ensure that the risk to clients' investment in construction is ameliorated.

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