AN EVALUATION OF CONSTRUCTION CASH FLOW MANAGEMENT APPROACHES IN CONTRACTING ORAGANIZATIONS

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Financial planning is central to the survival of any construction company. This is essential as lack of funds had been identified as the most common cause of business failure, and can lead to the failure of profitable and growing firms as well as those declining. On the other hand, a permanent surplus of funds, while less damaging is in itself an uneconomic state of affairs. As such, there is a need for adequate timing of fund availability in construction and deployment of excess fund to more productive use. This paper examines the construction cash flow management approaches in the UK contracting organizations through a questionnaire survey. Essentially, the survey examines the strategies adopted by construction firms in resolving deficit cash flow. It also investigates the extent of usage of some identified cash flow forecasting methods. By ranking the mean response data analysis was carried out. This enabled the major strategies employed for resolving deficit cash flow to be determined. It also aided the determination of major cash flow forecasting methods utilized by the industry. Further analysis was carried out using one-way analysis of variance (ANOVA). This enabled preferences of cash flow management approaches between different sizes of firms to be determined. Results showed the major approaches employed in resolving deficit cash flow and approaches preferred by different sizes of construction firms. Results further showed extent of usage of various cash flow forecasting methods. The findings are significant, as firm size seems to have direct implications on the approaches contracting firms adopt in cash flow management. The findings also have implications for further research in this area particularly for SMEs

Keywords: cash deficit, cash flow forecasting, contractor, UK.

INTRODUCTION

Financial management has long been recognized as an important management tool and proper cash flow management is crucial to the survival of a construction company because cash is the most important corporate resource for its day-to-day activities (Peer, 1982; Singh and Lakanathan, 1992). A proper cash flow management is also important as a means to obtain loans, as banks and other money lending institutions are normally much more inclined to lend money to companies that can present periodic cash flow forecasts (Navon, 1995). However, construction industry suffers the largest numbers of bankruptcy of any sector of the economy with companies failing because of poor financial management, especially inadequate attention to cash flow management (Boussabaine and Kaka, 1998; Calvert, 1986: 91-97; Harris and

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McCaffer2001). One of the final causes of bankruptcy is inadequate cash resources and failure to convince creditors and possible lenders of money that this inadequacy is only temporary. The need to forecast cash requirements is important in order to make provision for these difficult times before they arrive (Harris and McCaffer, 2001). Cash flow forecasting according to McCaffer (1976) provides a good warning system to predict possible insolvency. This according to him enables preventive measures to be considered and taken in good times. Many approaches to cash flow forecasting have been reported in literature (Kaka, 1999 and Kenley, 2001 and 2003: 3-8). Also many approaches to cash flow management abound in literature (Khosrowshahi, 2000, Harris and McCaffer, 2001 and Cormican, 1985). However, the construction industry's awareness and usage of these approaches is yet to be investigated. This then is the concern of this study.

CASH FLOW MANAGEMENT APPROACHES

Cooke and Jepson (1986) defined cash flow as the actual movement of money in and out of a business. Money flowing into a business is termed positive cash flow and is credited as cash received. Monies paid out are termed negative cash flow and are debited to the business. The difference between the positive and negative cash flows is termed the net cash flow. As there are different views held about what cash flow means in literature, cash flow as defined by Cooke and Jepson (1986) is the view upheld in this study and has been conceptualized by Odeyinka and Lowe (2001) and shown in Fig 1. According to Cooke and Jepson (1986), within a construction organization, positive cash flow is mainly derived from monies received in the form of monthly payment certificates. Negative cash flow is related to monies expended on a contract in order to pay wages, materials, plant, sub contractors' accounts rendered and overheads expended during the progress of the work. According to them, on a construction project, the net cash flow will require funding by the contractor when there is a cash deficit and where cash is in surplus the contract is self-financing. Short-term bank loans or overdraft facilities according to Cormican (1985) often meet the shortfall that may occur between the supply of funds and the need for cash. In recent years however, According to him, the credit facilities extended by financial institutions have been subject to more strict controls and this has often resulted in cash shortages in firms who may not suspect a threat from this source. The resulting shortage of cash may often force liquidation of assets and foreclosure by the company's creditors. A contractor may be forced to avail himself of short-term borrowing at very high interest rates (Cormican, 1985). Other approaches utilized in resolving cash deficit according to Harris and McCaffer (2001) and Kaka and Price (1993) include delayed payment to subcontractors and suppliers, tender unbalancing, utilizing company's cash reserves and overvaluation.

Mawdesley *et al*. (1997: 42-45, 64-67) emphasized the need for financial plan in cash flow management. This according to him would normally represent the planned position throughout a project and as such would be concerned with the income, expenditure and net cash flow. According to him, this enables the cash flow situation to be monitored using approaches such as pre-project cash flow plan or forecast, project phase monitoring/updating and monthly cost/value reconciliation. Kaka and Boussabaine (1999) and Mawdesley *et al*. (1997) emphasized the need to update cash flow forecast in the course of a project. The suggested frequency of updating cash flow forecast from these and other authors include weekly update, monthly and quarterly. Cormican (1985) is however of the opinion that updates should be done

when the deviations from the existing plan are such that the existing plan is meaningless or when the client requests an update.

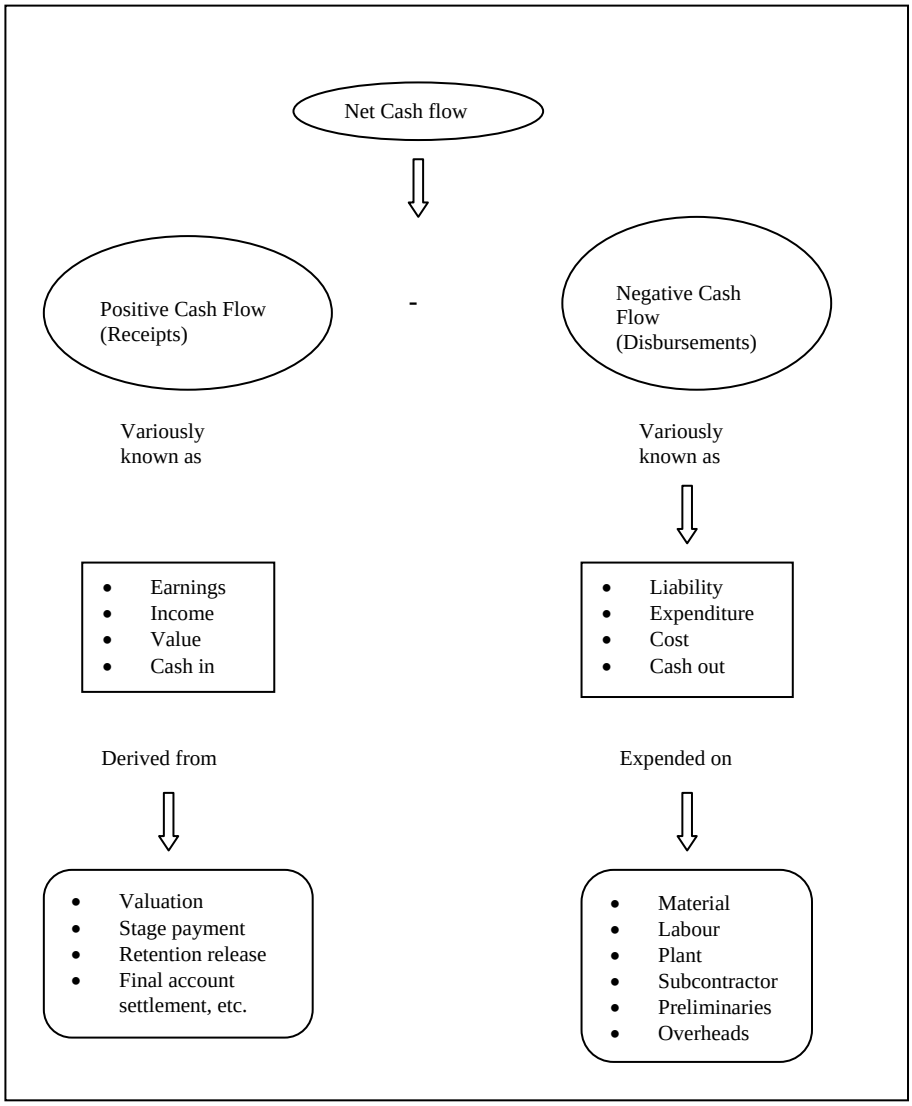

Fig. 1: Construction Cash Flow Concept (Source: Odeyinka and Lowe 2001)

The traditional approach to cash flow prediction usually involves the break down of the bill of quantities in line with the contract programme to produce an estimated expenditure profile. This could be expected to be reasonably precise provided that the bill of quantities is accurate and the contract program is complied with (Lowe, 1987). Although this traditional approach is presently being supplemented with the use of computer spreadsheet, it is likely to be slow and costly to produce; as such, several attempts have been made to devise a 'short cut' method of estimation, which will be both quicker and cheaper to utilize. Attempts have been made at the mathematical formulae and statistical based modelling of construction cash flow in both the contractor and client's organizations. This was demonstrated by the development of a series of typical S-curves by many researchers (Kaka and Price, 1993). The models obtained by these researchers rest on the assumption that reasonably accurate prediction is possible by means of a single formula utilizing two or more parameters which may vary according to the type, nature, location, value and duration of the contract. Kenley (2001) identified other cash flow forecasting methods to include the cost and value approach and the integrated system e.g. the cost/schedule integration.

Khosrowshahi (2000) reported the development of the *Advanced S-Curve (TASC),* software to aid cash flow forecasting. Other software developed include *FINCASH* (developed in Australia) and *Cybercube* (developed in the UK). While these cash flow management approaches and forecasting methods are recognized in literature, their extent of usage in the industry is yet to be investigated. This is the object of this study.

DATA AND METHODOLOGY

Data were obtained through a questionnaire survey of 350 randomly selected small, medium and large-scale UK contractors. A reminder letter subsequently followed this. In all, 100 responses fit for analysis were received, representing a 28.6% response rate which is typical of the norm of 20-30% response rate in most postal questionnaire survey of the construction industry (Akintoye and Fitzgerald, 2000). The questionnaire identified from literature and from discussion with industry practitioners, various approaches to resolving deficit cash flow. It also identified cash flow monitoring approaches as well as frequency of cash flow updating. The questionnaire identified further, various cash flow forecasting methods in use. Contractors were then requested to score on a Likert-type scale of 0-5, the extent of usage of the identified approaches. The measuring scale of 0 represents a situation where the approach was not used at all and 5 represents a very high extent of usage. This then gives the measuring scale the property of an interval scale, which enables the collected data to be subject to various statistical analyses. The questionnaire elicited information regarding the firms' annual turnover, which enabled their groupings into small, medium and large firms as shown in Table1. Information regarding respondents' designation was also obtained and this is summarized in Table 2. From the table, it is obvious that 96% of respondents are in senior management position with computed mean experience of 27.82 years and standard deviation of 9.39 years. This background information regarding the respondents indicates that responses provided by them could be relied upon for this study.

Table 1: Surveyed firms' turnover in the last financial year

Size	Turnover (£ million)	Frequency	Percent	Cumulative percent
Very small	Up to £5m	30	30.00	30.00
Small	5 - 25	24	24.00	54.00
Medium	25 – 100	20	20.00	74.00
Large	Over 100	26	26.00	100.00
Total		100	100.00	

Table 2: Respondents Designation

Respondent Designation	Frequency	Percent	Cumulative Percent
Managing Director	24	24	24.00
Director	46	46	70.00
Senior Manager	26	26	96.00
Manager	4	4	100.00
Total	100	100	

DATA ANALYSIS AND RESULTS

Data analyses were carried out using the Statistical Package for Social Sciences (SPSS). The analysis deals mainly with the ranking of the variables based on their

mean values. This was followed by the Analysis of Variance (ANOVA) to test the null hypothesis that the mean values of the dependent variables are equal for all the sizes of construction companies considered.

Strategies for resolving deficit cash flow

An analysis was carried out to evaluate the extent of usage of various strategies for resolving deficit cash flow. Table 3 summarizes the result of the analysis. From the table it can be seen that the major approaches to resolving deficit cash flow (negative difference between monthly cash in and cash out) are overvaluation, company's cash reserves, and tender unbalancing. Overall, the use of company's assets and borrowed fund to finance deficit cash flow are little used.

Contractors, irrespective of company sizes seem to be unanimous in their opinion as regards the extent of usage of various approaches in resolving deficit cash flow. This is shown in Table 3 by the *F*-statistic that compares the mean response between the very small, small, medium and large firms. The computed *F*-statistic shows no statistical difference at 5% level of significance. However, it is evident from Table 3 that while overvaluation was ranked 1st overall as an approach to resolving deficit cash flow, it also ranked 1st by large, medium and small firms, but ranked 2nd by the very small firm. This is not surprising because most firms would like to use the commercial strategy of overvaluation to improve their cash flow situation. This is because it is a risk-free strategy, which allows them to get paid in advance for work yet to be done. However, as the very small firms usually handle projects of very short duration, this strategy, though attractive, may leave them with little or no room for manoeuvre before the project is ended. As such, it is not surprising that this approach ranked 2nd under the very small firms.

Moreover, while 'company's cash reserve' ranked 2nd overall, it also ranked 2nd under large and small firms but ranked 3rd under medium firm while it ranked 1st under very small firm. It is also not a surprise that this approach received an overall ranking of 2nd. This is because like 'overvaluation', it is a risk-free strategy as it is the in-house cash reserve that is utilized in the short run without interest charge attached. However, this goes with the opportunity cost of it not being available for other productive use. The seemingly risk-free nature of this strategy may explain why it is the most favoured approach for the very small firms who have very little room to manoeuvre with 'overvaluation' strategy.

Furthermore, while 'tender unbalancing' ranked 3rd overall, it ranked 2nd under large and medium firms while it ranked 3rd under small and very small firms. It is also not surprising that this approach is ranked 3rd overall. This is because unlike the first two strategies, this strategy has a dimension of risk to it, which has to do with 'price manipulation' at the tendering stage. There is a need for very competent personnel to handle the use of this strategy for the associated risk to be substantially reduced. The medium and large firms who have established commercial departments have such personnel. As such, it is not a surprise that they rank this approach 2nd while the very small and small firm who may be lacking in such personnel ranked it 3rd.

A cursory look at the ranking of the overall mean in Table 3 shows that the further up the ranking one goes, the higher the increase in the level of risk associated to the strategies to resolving deficit cash flow. While the medium and large firms would use borrowed funds as a last resort (rank of 7), the very small firm would consider it as a

5th alternative while the small firm would consider it as the 6th alternative despite the risk associated with it. This is not a surprise because for the very small firm, there seems to be not much of a choice due to the weak financial base of the firm. The company's asset is small and money owed suppliers is not of much worth in cases as well. As such, while these options are available to them, for practical purposes, their use may not be of significant benefit to them.

Extent of usage of cash flow forecasting methods

Another analysis was carried out to investigate the extent of usage of various cash flow forecasting methods identified from literature and from discussion with construction practitioners. The result of the analysis is shown in Table 4. From this table, the major methods adopted for cash flow forecasting in the UK construction industry are the use of computer spreadsheet and the detailed approach (breakdown of bill item into cost/schedule). It is also evident from Table 4 that the value approach (based on project value) ranked higher (rank of 3) than the cost approach (based on the cost of input resources) with an overall rank of 4. The 'short cut' approach (using models/library of S-curves) has an overall rank of 5. The integrated system (computerized cost/schedule integration) has an overall rank of 6 while the usage of software developed to aid cash flow forecasting ranked lowest with cybercube (ranked 7th overall), TASC (The Advanced S-Curve) ranked 8th and FINCASH ranked 9th.

While the use of spreadsheet ranked 1st overall, it also ranked 1st under large, medium and small firms but ranked 2nd under the very small firms. This is a bit of a surprise as it is expected that with the quantity of research done on the 'short cut' approach to make cash flow forecasting easier and faster, there ought to have been a greater shift from the traditional approach adopted by the industry. Rather, the kind of shift noticed is from the manual detailed approach to the use of computer spreadsheet to process the work/schedule breakdown. Further, it is evident from Table 4 that while the detailed approach ranked 2nd overall, it however ranked 3rd under the large firm. It also ranked 2nd under both the medium and small firms, while it ranked 1st under the very small firm. Again, the overall rank of 2 for this approach is a bit of a surprise because it is expected that with the cumbersome and time-consuming nature of the detailed approach, contractors would like to shift to the usage of newly developed software like cybercube, TASC and FINCASH. However, this survey shows that the software is still to be embraced by the industry. This corroborates the observation of Brandon (2002) that the construction industry is slow at embracing innovation

Moreover, it is evident from Table 4 that the industry prefers the value approach to the cost approach in cash flow forecasting. This is not surprising because it is easier for the industry practitioners to use the project value based on breakdown of items from bills of quantities. According to Cooke and Jepson (1986: 203), the industry uses the cost approach rather for cost/value reconciliation than for forecasting. In post hoc modelling of cost flow data; Kaka and Price (1993) concluded that the cost approach to modelling cash flow forecast gave a better prediction than the value approach. This may explain why the industry that is used to forecasting based on value approach may find it difficult to embrace 'short cut' approach that gives a more reliable prediction using the cost approach.

Table 4 also shows that while contractors were unanimous in their scoring of the extent of usage of most forecasting methods, there is statistical difference of opinion regarding their scoring of the 'short cut' approach and 'intergraded system'. The 'short cut' approach ranked 5th overall while it ranked 4th under the large and medium

firms. It however ranked 5th under the small and very small firms. It is not surprising that this approach ranked higher under the large and medium firms. This is because the approach demands a higher level of expertise, which may not be available in the small and very small firms. This may therefore account for the statistical difference of opinion in scoring the variable. Moreover, the integrated system ranked 6th overall. It however ranked 5th under the large firm while it ranked 6th under the small to medium firms. This is not surprising because this approach is one that demands a large capital outlay, which while it may be affordable by the large firms, it may not be affordable by the small to medium firms. This again may account for the statistical difference of opinion by these categories of contractors in scoring the variables.

Furthermore, it is evident from Table 4 that the software developed to assist with cash flow forecasting ranked lowest in overall extent of usage (ranks of 7 to 9). While it is evident from the mean score in Table 4 that a few large and medium firms have used the cybercube and TASC, the small and very small firms surveyed have never used either at all. This again corroborates Brandon's (2002) observation that the construction industry is very slow in embracing new innovation. Finally, from Table 4, it is evident that only a very few large firms have used the FINCASH software while none of the small to medium firms has ever used it. This is not too surprising because the software was developed in Australia and so may not have gained popularity in the UK construction industry.

CONCLUSION

This paper has attempted to look into cash flow management approaches in the UK construction industry. Essentially, the paper investigated the strategies adopted by the industry for resolving deficit cash flow. It also evaluated the extent of usage of some identified cash flow forecasting methods. The paper concludes that the industry's preferences for resolving deficit cash flow appears to be on average, in the order of overvaluation, company's cash reserves, tender unbalancing, delayed payment to subcontractors, delayed payment to suppliers, use of company's assets and borrowed funds. This order appears to be according to the increasing level of associated risk; with overvaluation being the least risky and borrowed funds being the most risky strategy. It then suggests that risk perception seems to dictate contractors' preferences to the kind of strategy adopted for resolving deficit cash flow. While the above listed order reflects the situation in the medium and large firms, the smaller firms perceive the order of the strategies differently. Thus, firm size seems to influence the choice of strategies for resolving deficit cash flow. This may have implications for cash flow management in SME's. Moreover, the paper concludes that on average, the use of spreadsheet and the detailed approach of breakdown of bill items into work/schedule continue to be the dominant methods of cash flow forecasting in the UK construction industry. Furthermore, it is observed that the industry seems to prefer the value approach as opposed to the cost approach to cash flow forecasting. This is in spite of the fact that previous researches (Kaka and Price, 1993; Evans and Kaka, 1998) have demonstrated that cash flow modelling using the cost approach produces a more reliable result. This may also explain why the industry has not been able to embrace the 'short cut' approach. Finally, the paper concludes that the industry has not embraced the use of developed software to aid cash flow forecasting.

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Table 3: Strategies for resolving deficit cash flow

Strategy	Overall mean score	Rank	Large firms' mean	Rank	Medium firms' mean	Rank	Small firms' mean	Rank	Very small firms' mean	Rank	*F* Stat.	Level of significance (p values)
Overvaluation	3.28	1	3.83	1	3.60	1	2.91	1	2.86	2	1.292	0.289
Company's cash reserves	2.98	2	3.50	2	2.40	3	2.73	2	3.14	1	0.814	0.493
Tender unbalancing	2.62	3	3.50	2	2.50	2	2.09	3	2.36	3	2.156	0.107
Delayed payment to subcontractors	1.83	4	1.42	4	2.10	4	1.73	5	2.07	4	0.527	0.666
Delayed payment to suppliers	1.68	5	1.42	5	2.00	5	1.45	7	1.86	6	0.355	0.786
Company's assets	1.38	6	1.00	6	1.20	6	1.82	4	1.50	7	0.502	0.683
Borrowed funds	1.26	7	0.67	7	0.70	7	1.45	6	2.00	5	1.764	0.168

Table 4: Extent of usage of cash flow forecasting methods

Forecasting method	Overall mean	Rank	Large firms' mean	Rank	Medium firms' mean	Rank	Small firms' mean	Rank	Very small firms' mean	Rank	*F* Stat.	Level of significance (*p* values)
Spreadsheet	3.60	1	3.83	1	4.11	1	3.89	1	2.85	2	1.139	0.345
The detailed approach (breakdown of bill items into work/schedule)	2.93	2	3.17	3	2.67	2	2.67	2	3.08	1	0.284	0.836
Value approach (based on project value)	2.81	3	3.42	2	2.33	3	2.56	3	2.77	3	1.075	0.371
Cost approach (based on cost of input resources)	1.79	4	1.92	6	1.33	5	2.11	4	1.77	4	0.390	0.761
Short cut' approach (using models/library of S-curves based on past similar projects)	1.28	5	2.17	4	1.78	4	1.11	5	0.46	5	6.764	0.001*
Integrated system e.g. cost/schedule integration	1.14	6	2.17	4	0.89	6	1.00	6	0.23	6	3.324	0.029*
Cybercube	0.21	7	0.58	7	0.22	7	0.00	7	0.00	7	1.207	0.320
TASC (The Advanced S-Curve)	0.09	8	0.17	8	0.22	7	0.00	7	0.00	7	0.730	0.540
FINCASH	0.05	9	0.17	8	0.00	9	0.00	7	0.00	7	0.852	0.474

Significant at 5% level