

**ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES**



**ADDIS ABABA INSTITUTE OF TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING**

**Construction Cash Flow Management Practice In Selected
Leading Local Construction Companies**

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**A Project Submitted to School of Graduate Studies in Partial Fulfilment
of the Requirements for the Degree of Master of Science in Civil
Engineering (Construction Technology and Management)**

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ABSTARCT

Construction industry is a one of the most risky sectors due to high level of uncertainties included in the nature of the construction projects. Although there are many reasons, the deficiency of cash is one of the main factors threatening the success of the construction projects and causing business failures. Therefore, an appropriate cash planning technique is necessary for adequate cost control and efficient cash management while considering the risks and uncertainties of the construction projects.

The main objective of this project therefore is, to assess the current practice of construction cash flow management in the local construction industry. Accordingly, five leading construction companies are selected who have the largest stake in the building construction sector. It is tried to see the gaps in the subject matter through detail literature review and consultation of reputed professionals in the industry.

The paper is organized in to four chapters. The first chapter talks about the introductory part with sub-topics; background, statement of the problem, research questions, objective, scope and methodology. The second chapter discusses about the literatures review which is the major part of the paper. The third chapter, which is responsible part to show the practice on the local industry, contains the data collection and the discussion of findings. Finally, conclusions and recommendations are forwarded after analyzing the literature and international experience with the local practice. When you go through it, hopefully you find it valuable and I think it adds a little thing in the industry by serving as a secondary data for further research works in the area.

Key Words: Cash flow management, Cash in, Cash out, Cash flow prediction, cash deficiency

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1. INTRODUCTION

1.1 GENERAL

During the past five years (first growth and transformation plan of Ethiopia) the Ethiopian government and private sectors have been investing hugely in the development of infrastructures. Building construction projects of housing development, educational institutes expansion projects, different public organizations offices, private multipurpose buildings and other buildings were among those infrastructures built by grade one contractors.

Experience and various reports indicate that the performances of these projects were recurrent and serious problems were addressed. That is, most of these projects were not implemented as per expectations or used to face considerable performance variance on timely completion. The evidence from many projects revealed that these problems are not being adequately dealt with. One of the problems addressed is contractor's cash flow management ineffectiveness [1].

In my experience, inadequately detailed planning practice and abuses on cash utilizations are major contributors for cash shortages in construction undertakings which this paper has tried to find finally.

As cash is one of the resources in executing building projects and cash flow forecasting is based on planned site activities, the chances of inability to meet cash flow requirement, during construction stage, can cause incapability in financing projects and difficulty in delivering projects on time [2].

A cash flow forecast shows the anticipated income and expenditure of the business and resulting surplus or shortfall which will occur each month. While a thorough knowledge of your business profitability is vital, it is even more important to know the state of the business cash flow i.e. where your money is, where it is coming from and where it is going to. Many businesses fail because they fail to control their cash flow. [3]

A cash flow can be used as follows:

- It establishes how much money is needed and when it will be needed
- It helps to ensure that capital expenditure is properly controlled (e.g. the 'what if' situation)
- It encourages efficient use of resources through budgeting and the analysis of over and under spending
- It helps with facing facts and decision making.

Generally, cash flow management is all about balancing the cash coming into the business with the cash going out. The danger is that demands for cash, from the suppliers, employees or the subcontractors, arrive before cash you are owed is collected. More often, cash inflows seem to lag behind your cash outflows, leaving your business short. This money shortage is your cash flow gap.

By understanding cash flow and planning ahead, we can avoid problems and shortages, provide stability to our organizations, and take advantage of opportunities to purchase capital assets and build organizational capacity. Managing cash flow is not a one-time activity. Projections should be updated and reviewed regularly. The frequency will depend on how closely the organization's cash flow needs to be monitored.

1.2 STATEMENT OF THE PROBLEM

The reputation of construction industry as a high-risk business is due to the high level of business failures which is far beyond those in many other industries. While these failures result from the combination of several factors, the financial-related causes account for a considerable proportion of them, manifesting themselves in low returns, losses and, in some cases, liquidations. Even profitable construction companies can fail due to poor cash flow management [3].

Construction industry is a one of the most risky sectors due to high level of uncertainties included in the nature of the construction projects. Although there are many reasons, the deficiency of cash is one of the main factors threatening the success of the construction projects and causing business failures [4].

Business failure of the construction companies is the most important result of the fragile structure of the construction sector. Although there are various reasons of business failure, according to many construction management researches like Peer and Rosental (1982), Pate Cornell et al. (1990), Singh and Lakanathan (1992), Kaka and Price (1993), Boussabaine and Kaka (1998), the main reasons of the bankruptcy of the construction companies is the inefficient control and management of cash. Therefore, controlling and regulating the movement of the cash is necessary for the success of the construction projects.

Companies fail because of poor financial management, especially inadequate attention to cash flow forecasting. It is common consensus that cash flow management and liquidity are key elements in the survival of contractor [5].

1.3 RESEARCH QUESTIONS

The paper has the following questions that has been tried to address.

- 1) How do some selected local contractors manage their cash flow?
- 2) What is the current practice of cash flow management in the local construction industry?

- 3) How do contractors mitigate for cash shortages?
- 4) What methods and mechanisms shall be deployed as a solution?

1.4 OBJECTIVE OF THE PROJECT

The aims of the project are listed below:

- 1) To assess the current practice of construction cash flow management of some selected leading local construction company's and its impact on project performance.
- 2) To identify the international practices.
- 3) To forward recommendations or methods that improve cash flow forecasting for better project performance with regard to time and cost and,
- 4) To serve as a secondary data for those interested to do detail research in the area.

1.5 SCOPE OF THE PROJECT AND LIMITATIONS

This project on cash flow management in the construction industry of Ethiopia is limited in scope to the following:

- 1) The study is limited to the cash flow management of selected leading grade 1 contractors working on building construction projects.
- 2) Only contractors' perspective is considered in the research, hence from the client's organization and consultant's perspective could be totally different. But clients' cash flow will be seen as it affects contractors' cash flow.
- 3) The study covers on cash flow practice of selected local contractors participating on building construction projects.
- 4) The study focuses on cash flow management without including discounted cash flow and time value of money.

One of the limitations of this project is a small number of highest grade contractors registered in the federal government are being under the study. Those that are registered on regional basis and lower grade contractors are not part of this paper as time is inadequate and no budget is allocated. Research made locally in the specific area couldn't be found and it makes difficult to really show the negative impact objectively in this short period of time.

1.6 METHODOLOGY OF THE STUDY

This project paper is started with unstructured preliminary literature review during proposal preparation: to get an in depth knowledge of the subject area attributed to construction cash flow management; to assess the level of existing knowledge and identify gaps to select project title and identify suitable research methods for data collection and analysis.

The primary data is collected with questionnaire desk interview of experienced professionals from selected leading local contractors. The contractors being selected are those who are performing well and with highest annual gross revenue. Accordingly, five local construction companies are selected and two experienced professionals from each companies are requested to fill the forms with desk interview. Besides, some highly experienced construction professionals with lots of exposure in building constructions which are not working in the selected contractors are consulted and their feed backs are being used.

The data collected from questionnaire survey studies is analyzed and discussions made based on the findings of the analysis. Finally, conclusions is made and recommendations are forwarded according to the gaps seen between the literature and the local practice.

2. LITERATURE REVIEW

2.1 OVERVIEW AND THE NEED FOR CASH FLOW FORECASTING BY CONTRACTORS

Execution of construction projects can make substantial demands on a contractor's cash. Initially, the contractor faces mobilization of workers and equipment, and setting up costs. The contractor's expense on a project typically exceeds its monthly progress payment income over an appreciable part of the construction period. The cash deficit on the project must be made up from the contractor's working capital, or money must be borrowed to provide the necessary operating funds. 'Cash flow' refers to a contractor's income and outlay of cash. The net cash flow is the difference between disbursements and income at any point of a time. A negative net cash flow means disbursements are exceeding income which is a usual situation on even a highly profitable project during the greater part of its duration [6].

A determination of the future rates of cash disbursements and cash income, together with their combined effect on the project cash balance, is called a cash flow forecast. It is the intent of the contractor to accrue income faster than it accrues costs. At the end of the project, this difference represents the contractor's profit. The problem is that the cost of the work put into a project is not directly related to the resulting income. Additionally, the time delays between the accrued costs and the cash disbursement are not the same as the time delays between the accrued income and the cash receipts.

To forecast the amount of money the contractor must invest in the project, it is necessary to estimate the amount and the timing of the cash disbursements and the cash receipts. The cash flow projection approximates the progress payments for each payment period during the construction contract. This projection is used by the owner to make financial arrangements, which makes funds available for the payments and optimizes investment opportunities. The contractor uses the cash flow projection for anticipating revenue for future periods [6].

Projection of cash flow is directly related to the construction schedule which is a cost estimate of planned activities and achievements at the site. Many factors influence the actual amount of interim payments which may produce variances from the projection; i.e. late or early delivery of

materials; late or early completion of work activities; revisions in sequencing of work activities; and the unequal completion of work activities as planned.

Studies and investigations have shown that lack of liquidity is a major problem causing construction project failure. A model for accurately predicting trends in a project's cash flow prior to the construction phase has been a prevailing challenge. But, early knowledge of the factors affecting cash flow and an understanding of the impact is essential to the contractor. Throughout the construction process, contractors need to be comparing the actual income and expenses against the forecasted values. If there are discrepancies between these values, the contractor needs to adjust the schedule and update the project plan to match the estimated situation as early on as possible. With good knowledge of cash flow forecasting, the contractor could more efficiently and accurately manage cash flow during the construction process to prevent extra costs and avoid project failure [7].

According to (Peer, 1982; Singh and Lakanathan, 1992), 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.

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; Harris and McCaffer 2001).

One of the final causes of insolvency 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. In times of high interest rates the need for cash flow forecasting is even more important and Sandilands, in his *inflation accounting* report to government, highlighted the need to forecast cash flow in times of inflation and thus avoid an embarrassing cash deficit when replacing old equipment at new inflated costs.

There is evidence that some smaller companies confuse profit flows with cash flows and make misleading calculations (Harris and McCaffer, 2001). A cash flow is the transfer of money into or out of the company. The timing of cash flow is important. There will be a time lag between the entitlement to receive a cash payment and actually receiving it. There will be a time lag between being committed to making a payment and actually paying it. These time lags are the credit arrangement that contractors have with their creditors and debtors. It is these credit arrangements, stock levels and depreciation that make cash and profit different.

2.2 CASH FLOW MANAGEMENT APPROACHES AND FORECASTING METHODS

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 shown in the figure below.

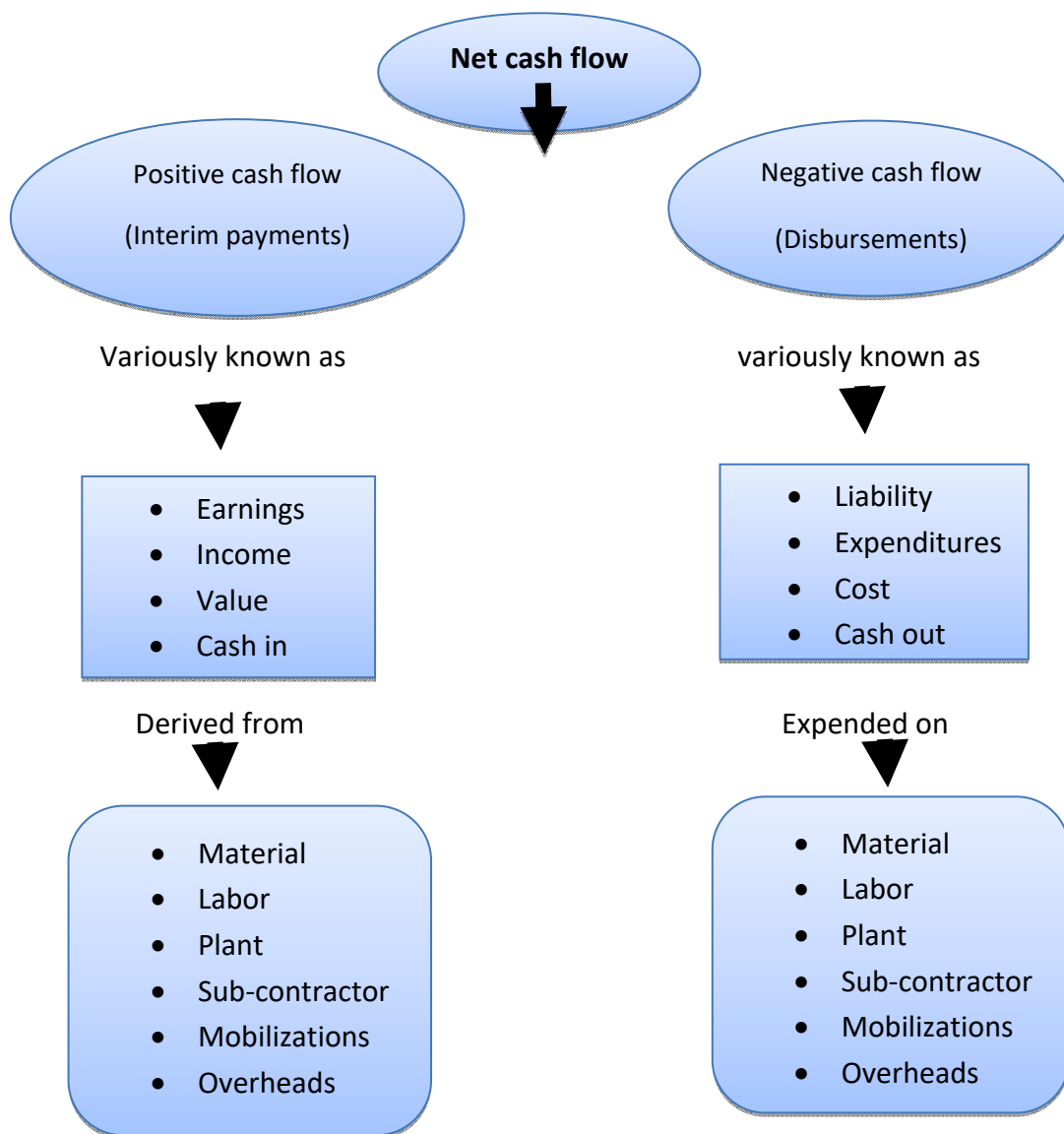


Figure 1 Construction cash flow concept (Source: [7]).

Mawdesley *et. al.* (1997) 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.

The traditional approach to cash flow prediction usually involves the breakdown of the bill of quantities in line with the contract program 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 modeling 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 (2003) identified other cash flow forecasting methods to include the cost and value approach and the integrated system e.g. the cost/schedule integration. Kenley, developed a

'Logit net cash flow' model using actual component inward and outward cash flow data in order to form a residual cash flow model. While developing the model, he had recognized the stepped nature of cash flows and although it was quite suitable for representing real data, he felt that it could not be represented for any form of modeling, forecasting or simulation. He therefore smoothened the steps to remove the jagged nature of the net cash flow. Kenley's model was based on empirical project data that used the actual component inward and outward cash flow data in order to form the residual model. This model had adopted the Logit gross cash flow model by Kenley and Wilson, to model the component curves. When combined, the component curves form a net cash flow model reflecting the true net cash position for each project. The final model is still based on smoothened out 'S' curves instead of step curves.

Park, Han & Russell (2005) attempted to estimate cash flows by categorization of different project activities on the basis of time lags involved between their physical occurrences of different stages and the related cash flows and identifying the characteristic movement of cumulative cash flow against time of the activity. Various cost categories were identified for material, labor, equipment, sub-contracts and overheads and depreciation since each of these categories had a different time lag and a cash flow profile. Typical 'cash flow curves' were developed for each of the different categories based on moving weights system and were converted to mathematical equations for cash inflows and outflows. The overall cash flows were worked out by consolidating these equations to the project schedule.

Jarrah, Kulkarni & O'Connor (2007) collected actual cash flow data in form of monthly account summary reports for various projects under Texas Department of Transportation. The sample consisted of different category of projects such as construction and replacement of bridges, new non-freeways, road overlay and rehabilitation of existing roads, landscape scenic enhancements, widening of freeways etc. Projects were further classified in different cost ranges. Based on the scatter chart of payments against time for different projects in a given category, a fourth degree polynomial regression analysis was used to obtain the cash flow curves that turned out to be characteristic 'S' shaped for most of the projects. Although statistical significance could not be proved due to limited availability of data, a feasible

approach for cash flow prediction was established. Since the data was related to payments to the contractor, only the cash inflow curves could be established. Extending the same methodology to data for contractor's cash outflows, there appears to be a possibility of working out net working capital gap.

A model developed by Görög (2009) suggested a set of new measurements and indicators in line with the 'earned value' measurements and indicators, for possible integration of both systems. Therefore similar to the earned value measurements such as Budgeted Cost of Work Scheduled (BCWS), Budgeted Cost of Work Performed (BCWP) and the Actual Cost of Work Performed (ACWP) for working out the Cost Performance and Schedule Performance Indices (CPI and SPI); the new set of measurements and indicators was based on the 'Price Value' and 'Invoice Value' of the contracted work. This could therefore forecast the difference between price to be received by the contractor from client and the cost to be expended by the contractor for the amount of work carried out at any point of time. Hence the differential indicated expected margin based on project status. Since the methodology explained in the model worked out the values on accrual basis and did not recognize the time difference in their occurrence and therefore could not be found useful to forecast and monitor cash flows in financial sense.

A software 'FINCASH for Windows' developed by CSIRO, Australia, that was specifically designed for project cash flow management was compared by O'Leary and Tucker , with present methods for cash flow projections using project management software such as Primavera P3, Suretrak and Microsoft Project. FINCASH made use of a library of cash flow 'S' curve profiles that were characteristic of the particular type of project under consideration. These cash flow profiles were developed on the basis of past experience and amenable to modification and refinement as more data becomes available. This eliminates the need for specifying cash flow profiles for individual activities as is the case with other project management software and hence was claimed to be easier to use. However the FINCASH software has the same limitation like other project management software i.e. it gives only the

cash outflows based on costs and associated time lags in payments, but does not account for the cash inflows that are very important for the contractor [8].

A computer program CAFFS (CASH Flow Forecasting System) was developed by Hwee & Tiong (2002) for predicting cash flow profile of a construction project. The program took into account contractual factors in a project as well as working practices and trends that affect the project's cash flow. Impact of uncertainties and risks such as excess measurement, variation of contract, cost fluctuation etc. could also be reflected on the cash flow profile. Internal Rate of Return (IRR) based on monthly cash flows and maximum working capital requirement were the primary outputs that could be most useful to the contractor and also act as indicators to project's performance. The input data such as contract value, duration, defect liability period, percentage markup, payment delay period, retention limit and estimated proportions of different cost groups (material, labor, equipment, subcontracts and overheads) were coupled with typical 'S' curve profiles for different cost groups to develop a theoretical 'S' curve profile for the project. Output of the program was cumulative monthly cash outflows and cash inflows. The program could therefore be used for predicting the cash flows as the project progressed as well as to understand the impact of risk factors on project cash flows.

The models carried out so far as seen above has always assumed cash flows as continuous functions and have tried to fit them in different types of curves such as second, third, fourth or fifth degree polynomials to see the best fit. It was also observed the cash flow curves were always assumed to follow the sigmoid curves or more commonly known as 'S' curves that generally represent typical expenditure curve or a 'cost-flow' curve for a project. However, cash flows in reality do not progress continuously, but occur at specific points of time. Therefore mathematically, cash flows are not continuous functions but are step functions and any projection made on the assumption of them being continuous functions would be inaccurate and therefore unreliable in practice. While modeling cash flows as continuous functions may be a mathematically reasonable approximation, it tends to average out the values occurring at different times by a smooth curve and may hide the likely cash deficits that may occur between

the two periods. This difference cannot be ignored since cash flow shortfall, even for an extremely short duration of a few days, can have acute real consequences on a project [9].

Khosrowshahi (2000) reported the development of the *Advanced S-Curve (TASC)*, software to aid cash flow forecasting. Other software includes *Cybercube* (developed in the UK). Generally, the following construction cash flow forecasting methods and models are some among others:

- Spread sheet (MS Excel)
- The detailed approach (break down of bill of items into work/schedule)
- Value approach (based on project value)
- Cost approach (based on cost of input resources)
- Short cut approach (using models/library of S curves based on past similar projects)
- Integrated systems (e.g. cost/schedule integration)
- Cybercube (developed in the UK)
- TASC (the advanced S-curve)
- FINCASH (developed in Australia)

There are many more papers by researchers that try to further refine the process of cash flow forecasting to bring it nearer to the real life situation, but still have their limitations for universality in application. These cash flow models assume that only a few variables are sufficient to derive an ideal construction project cash flow curve. However, each project follows a unique process cycle that results in individual variation between projects that do not allow it to be fitted into a standardized model [9].

2.3 PROJECT CONTRACT CASH FLOW

According to (Harris and McCaffer, 2001), contractors who undertake cash flow forecasting do so at two levels. One is at the estimating and tendering stage, when the forecast is just for the single project being estimated. The other level is the calculation of a cash flow forecast for the company, division area; this involves aggregating cash flows for all active projects and is done regularly every quarter or every month.

These two types of forecasts require different treatments. The estimator has all the project details at the estimating stages and, because the forecast applies only to one project, the estimator can produce a carefully calculated forecast based on these details by allocating bill items for activities on the pre-tender bar chart or network. This creates a direct link between the estimator's build-ups for each item with the pre-tender construction program and follows the production of value versus time and cost versus time curves from which cash-in and cash-out can be calculated.

At the project level, a project's cash flow is the difference between the project's expenses and income. At the construction company level, the difference between company's total expense and its total income over a period of time is the company's cash flow.

$$\text{Cash flow} = \text{Cash in} - \text{Cash out} = \text{Income} - \text{Expense}$$

Forecasting cash flow is necessary for a construction company for the following reasons:

- To ensure that sufficient cash is available to meet the demands.
- It shows the contractor the maximum amount of cash required and when it will be required. Thus, the contractor can made arrangements to secure the required cash.
- It provides a reliable indicator to lending institutions that loans made can be repaid according to an agreed program.
- It ensures that cash resources are fully utilized to the benefit of the owner and investors in the company.

The three main components in determination of cash flow are:

- Expenses (cash out) which represents the aggregate of the payments which the contractor will make over a period of time for all resources used in the project such as labor, equipment, material, and subcontractors.
- Income (cash in) that represents the receipts a contractor will receive over a period of time for the work he/she has completed.
- Timing of payments: in cash flow analysis, the main interest is the timing of payments related to the work done by the contractor.

2.3.1 CONSTRUCTION PROJECT COSTS

In preparing the cash flow for a project, it is necessary to compute the costs that must be expended in executing the works using activities durations and their direct and indirect costs. The principal components of a contractor's costs and expenses result from the use of labors, materials, equipment, and subcontractors. Additional general overhead cost components include taxes, premiums on bonds and insurance, and interest on loans. The sum of a project's direct costs and its allocated indirect costs is termed the project cost.

The costs that spent on a specific activity or project can be classified as;

- **Fixed cost:** costs that spent once at specific point of time (e.g., the cost of purchasing equipment, etc.)
- **Time-related cost:** costs spent along the activity duration (e.g., labor wages, equipment rental costs, etc.)
- **Quantity-proportional cost:** costs changes with the quantities (e.g., material cost)

Project direct costs are the costs and expenses that are incurred for a specific activity are termed direct costs. These costs are estimates based on detailed analysis of contract activities, the site conditions, resources productivity data, and the method of construction being used for each activity. A breakdown of direct costs includes labor costs, material costs, equipment costs, and subcontractor costs.

Project indirect costs are other costs such as the overhead costs are termed indirect costs. Part of the company's indirect costs is allocated to each of the company's projects. The indirect costs always classified to: project (site) overhead; and General (head-office) overhead.

Project overhead – Project overhead are site-related costs and includes the cost of items that cannot be directly charged to a specific work element and it can be a fixed or time-related costs. These include the costs of site utilities, supervisors, housing and feeding of project staff, parking facilities, offices, workshops, stores, and first aid facility. Also, it includes plants required to support working crews in different activities.

A detailed analysis of the particular elements of site-related costs is required to arrive at an accurate estimate of these costs. However, companies used to develop their own forms and checklists for estimating these costs. Site overhead costs are estimated to be between 5% - 15% of project total direct cost.

General overhead -The costs that cannot be directly attributed a specific project called general overhead. These are the costs that used to support the overall company activities. They represent the cost of the head-office expenses, managers, directors, design engineers, schedulers, etc. Continuous observations of the company expenses will give a good idea of estimating reasonable values for the general overhead expenses. Generally, the general overhead for a specific contract can be estimated to be between 2% - 5% of the contract direct cost. The amount of the general overhead that should be allocated to a specific project equals:

$$\frac{\text{Project direct cost} \times \text{general overhead of the company in a year}}{\text{Expected sum of direct costs of all projects during the year}}$$

Having identified the direct costs, indirect costs, then the project total cost equals the sum of both direct and indirect costs. When studying cash flow, it is very important to determine the actual dates when the expenditures (cost) will take place. At that time, the expenditures will be renamed as the expenses. [Figure 2 illustrates](#) the difference between the costs and the expenses. As shown in the figure, they are the same except the expenses are shifted (delayed) than the costs.

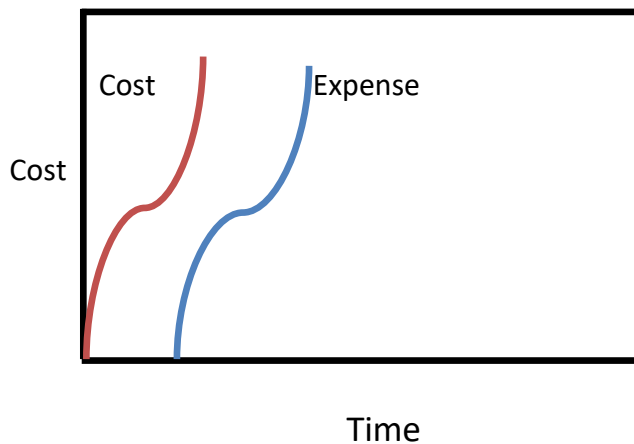


Fig. 2 (Project cost and expense curve)

2.3.2 THE S – CURVE

Due to their peculiar execution cycle, projects follow a sigmoid or 'S' curve pattern in their progress from start to completion as compared to a steady level maintained by continuously running manufacturing or trading activity. As per the standard accounting practice of booking the cost on accrual basis, incurrence of cost on a project that is directly linked to the physical progress of project activities is also proportional to the physical progress and therefore follow the 'S' curve [9] .

It has also been established that the cash flows relating to the activities have different timings than the incurrence of costs. For a contractor working on a project, the cost is incurred on a continuous and regular basis while the payment for the work completed on a periodic basis is received from the client after certain time lag as per the terms of the contract. Similarly, payments for the materials, equipment and sub-contractor also occur with a time lag except for the advances given initially. Therefore it is generally assumed that the cash flows – inflows and outflows – follow a pattern of 'S' curve albeit with a time lag from the 'S' curve for project expenditure [9].

The curve represents the cumulative expenditures of a project direct and indirect costs over time are called the S-curve as it takes the S-shape. In many contracts, the owner requires the

contractor to provide an S-curve of his estimated progress and costs across the life of the project. This S-shaped of the curve results because early in the project, activities are mobilizing and the expenditure curve is relatively flat. As many other activities come on-line, the level of expenditures increases and the curve has a steeper middle section. Toward the end of a project, activities are winding down and expenditures flatten again. The S-Curve is one of the most commonly techniques to control the project costs. Toward the end of a project, activities are winding down and expenditures flatten again (Figure 3).

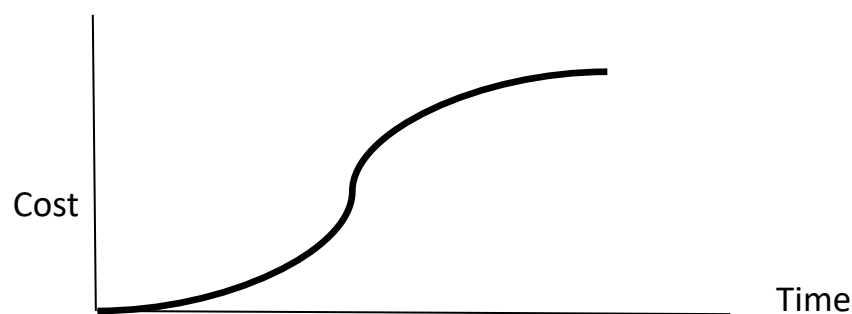


FIG.3 a sample S curve

An S-curve for a project can be developed using the following steps:

- Constructing a simple bar chart for all the tasks of the project.
- Assigning costs to each task using task duration.
- Plotting the cumulative amounts of expenditures versus time by smoothly connecting the projected amounts of expenditures over time.

2.3.3 PROJECT INCOME (CASH-IN)

The flow of money from the owner to the contractor is in the form of progress payments. Estimates of work completed are made by the contractors periodically (usually monthly), and are verified by the owner's representative. Depending on the type of contract (e.g., lump sum, unit price, etc.), these estimates are based on evaluations of the percentage of total contract completion or actual field measurements of quantities placed. Owners usually retain 5% of all validated progress payment submitted by contractors (PPA 2006). The accumulated retained

payments are usually paid to the contractor with the last payment. As opposed the expenses presented in Figure 3 with smooth profile, the revenue will be a stepped curve. Also, when the contractor collects his/her money it is named project income (cash in) as shown in the [Figure](#).

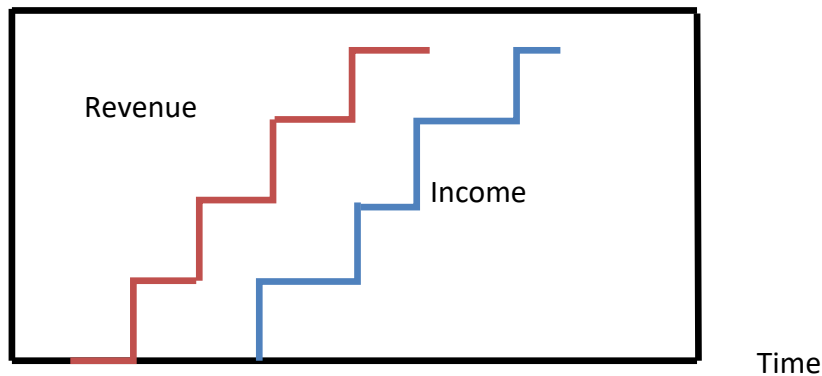


Fig.4 Project revenue and income curves

The time period shown in Figure 3 represents the time intervals at which changes in Income occur. When calculating contract income it is necessary to pay attention to the retention and/or the advanced payment to the contractor if any.

Retention - Retention is the amount of money retained by the owner from every invoice, before a payment is made to the contractor. This is to ensure that the contractor will continue the work and that no problems will arise after completion. These retain amount ranges from 5% to 10% and hold by the owner from every invoice till the end of the contract. The whole amount will be paid to the contractor at the end of the contract.

Advance payment - This is amount of money paid to the contractor for mobilization purposes. Then, it is deducted from contract progress payment. Applying this strategy improves the contractor cash flow and prevents him/her from loading the prices at the beginning of the contract. This strategy, however, may be used only in projects that require expensive site preparation, temporary facilities on site, and storage of expensive materials at the beginning of the project.

2.3.4 CALCULATING CONTRACT CASH FLOW

Having determined the contract expenses and income as presented in the previous section, it is possible to calculate the contract cash flow. If we plotted the contract expense and income curves against each other, then the cash flow is the difference between the points of both curves. [Figure 5](#) below shows the cash flow of a specific contract. The hatched area represents the difference between the contractor's expense and income curves, i.e., the amount that the contractor will need to finance. The larger this area, the more money to be financed and the more interest charges are expected to cost the contractor.

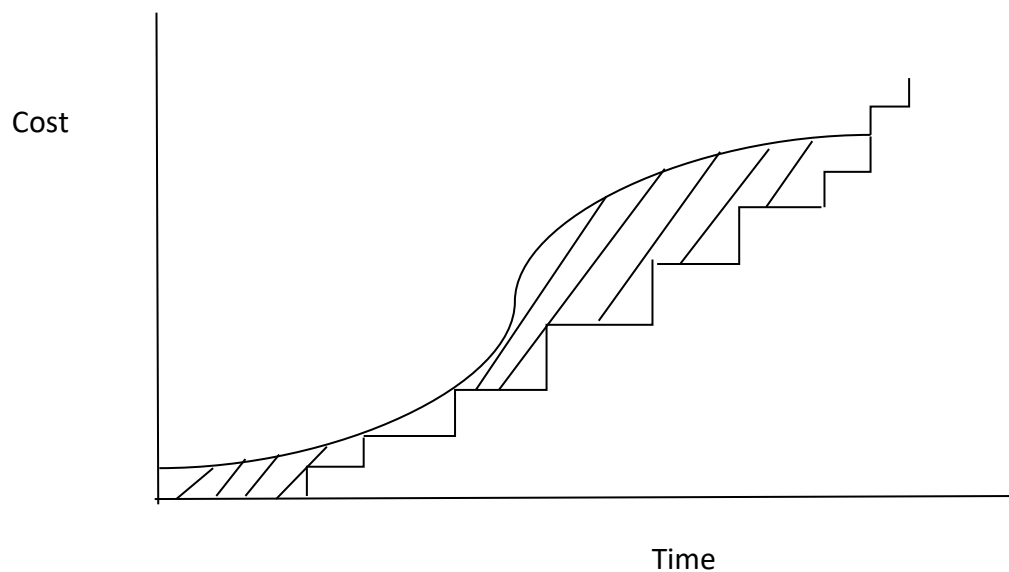


Fig.5 Cash flow based on monthly payments

The contractor may request an advanced or mobilization payment from the owner. This shifts the position of the income profile so that no overdraft occurs as shown in [Figure - below](#).

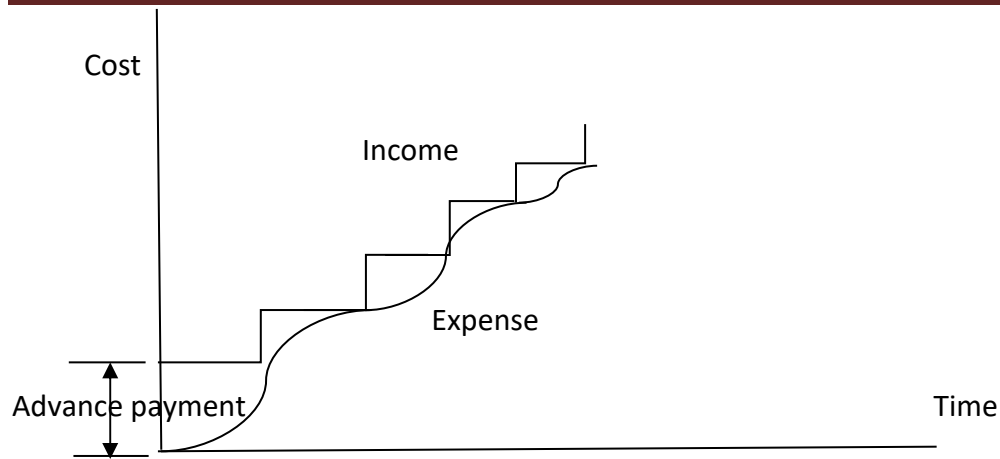


Fig.6 Effect of advanced payment on improving cash flow

The cash flow calculations are made as described in the following steps:

- Perform project schedule and determine project and activities timing.
- Draw bar chart based on early or late timings.
- Calculate the cost per time period.
- Calculate the cumulative cost.
- Adjust the cost according the method of paying it to produce the expenses.
- Calculate the cumulative revenue (revenue = cost x (1 + markup)).
- Adjust the revenue based on the retention and delay of owner payment to determine the income.
- Calculate the cash flow (cash flow = income – expense) at the contract different times.

2.4 STRATEGIES IN MINIMIZING CONTRACTOR'S DEFICIT CASH FLOW

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, subcontractors' 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. 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.

It is very essential to the contractor to minimize his/her negative cash flow because this may hinder him/her during performing the contract due to lack of financial resources. Among the procedures the contractor may follow to minimize negative cash flow is:

- **Loading of rates**, in which the contractor increases the prices of the earlier items in the bill of quantities. This ensures more income at the early stages of the project. However, this technique might represent a risk to the contractor or the owner.

- Adjustment of work schedule to late start timing in order to delay payments. In this case, the contractor should be aware that in this case in delay might happen will affect the project completion time and may subject him/her to liquidated damages.
- Reduction of delays in receiving revenues (try to collect interim payments from the client as fast as possible). The time between interim measurement, issuing the certificate and receiving payment is an important variable in the calculation of cash flows. Although monies out goes to many destinations, e.g. labor, suppliers, rentals and subcontractors; the monies in comes from only one source i.e. the client. Thus any increase in the delay in receiving this money delays all the income for the contract with the resulting in the capital lock-up.
- Asking for advance or mobilization payment (In local contracts there is provision).
- Achievement of maximum production in the field to increase the monthly payments.
- Increasing the mark up and reducing the retention.
- Adjust the timing of delivery of large material orders to be with the submittal of the monthly invoice.
- Delay in paying labor wages, equipment rentals, material suppliers and subcontractors.

The following are list of strategies for resolving deficit cash flow in a construction company:

- Company's cash reserve
- Tender unbalancing (it may be a factor for rejection of bids in our country)
- Delayed payment to subcontractors
- Delayed payment to suppliers
- Company's asset
- Borrowed funds...

The earlier you anticipate cash flow issues, the easier it is to address them. The most effective way to manage cash flow is to develop and maintain cash flow projections that look forward as much as possible in the life of the project. In order to avoid cash flow problems:

- Develop realistic, well-considered budgets for each project
- Consistently operate with the goal of a surplus of income over expenses
- Build internal cash reserves over time
- Plan early and regularly
- Be aware of cash flow and budget assumptions and react to changes
- Maintain good relationships with vendors, contractors, and banker

Once you have a cash flow projection, you are then able to:

- Plan the use of cash
- Prepare to avoid problems
- Respond to changes and revise plans

Above in view, it can be generalized that in order to minimize cash deficit, one has to plan in detail based on reliable data and information so that it will be possible to be proactive than reactive before a difficulty happens. Here controlling and monitoring the forecast on regular basis is crucial to take corrective actions in advance and make revisions timely.

2.5 FACTORS AFFECTING CASH FLOW PREDICTIONS

Cash flow forecasting is, like any forecasting, the result of calculations based on the information available at the time and a few assumptions as to what will happen. If as likely, the data contained in the information changes or the assumptions alter, the forecast will be in error and a few forecast is required to revise it again and again (Harris and McCaffer, 2001) .

The factors which affect contractor's cash flows are;

- The duration of new projects,
- The profit margin on these projects,
- The retention condition,
- the delay in receiving payment from the client,
- The credit arrangements with suppliers and the phasing of the projects in the company's work load and
- The late settlement of outstanding claims. As many projects last one, two or three years the cash flow forecasts should also look this far ahead (Harris and McCaffer, 2001).

The expectation of construction participants especially clients has not been met due to non-achievement of project success as expected. Client has a role to arrange for finances for the project and make predictions of the total cost of the project and associated fees and charges.

According to Sambasivan and Soon (2007), construction involves huge sum of money and most contractors find it very difficult to bear the heavy daily construction expenses when payments are delayed which will invariably affect the progress of work. Also, one of the main problems faced by contractors is delay in receiving payment from the client; to prevent this, there is need for client to predict the cash flow so as to know how to source for the required amount at the right time to meet up with the contractors' expectation (Ojo, 2010). However, Onukwube (2005) revealed that an accurate forecast of construction cash flow has been a difficult issue due to risks and uncertainties inherent in construction projects.

High uncertainty and risk among other factors have been identified as factor that makes construction industry to be vulnerable to bankruptcy (Wang and Hg, 2010). Risk is an important issue to contractors as well as clients and consultants of the industry. However, the problems of risk assessment are complex and poorly understood in practice (Laryea, 2008).

The determinants of success of any project are delivery within the appropriate cost limit, measurable time frame, acceptable quality standard and a high level of client satisfaction. However, this has not been achieved; research work of NIQS (2003) revealed that projects are not actualized as budgeted. Construction is often cited as a highly risk- prone business because of the unique nature of the industry and its projects (Laryea, 2008). Risk in relation to construction is a variable in the process of construction project whose variation results in uncertainty as to the final cost, duration and quality of the project (Bufaied, 1987; Akintoye and MacLeod, 1997).

According to Raftery (1994), risks have an upside, where there is possibility of gain, and a downward, when a loss may be incurred. Therefore, risk management becomes important in reducing (or possibly eliminating) uncertainty via hedging to protect against unfavorable outcomes. Odeyinka (2003) and Ojo (2010) emphasized that effect of risk is assessed through the risk factors, there is usually insufficient objective data to adequately calculate the occurrence and impact of risk events because of the individual nature of construction projects; hence some degree of subjective judgment is usually required.

Sidewall and Rumball (1982) identified building type, height, shape and design characteristics, and external environmental influences, individual contractors pricing characteristics and weather as causes of low accuracy of predicted cash flow.

Peters (1984), agreed that the overall success of cash flow forecast depends essentially on mode of payment, quality and reality of project program, method of assessing interim payment, risk, level of required information, retention, currency of data, delay in honoring architect instruction and overestimating.

Other factors identified were seasonal effects on construction works, variability in preliminary expenses, contract extensions of time for inclement weather and valuations (Calvert, 1986); estimating error, tendering strategies, cost variances and duration overrun (Kaka and Price, 1993 and Kaka, 1996); delay payment and difficulty in obtaining the right amount of funds at reasonable interest rates (Khosrowshahi, 2000); retention, claims, tender unbalancing and delay in receiving payments (Harris and McCaffer, 2001).

Lowe (1987) and Laufer and Coheca (1990) grouped causes of inaccuracy of predicted cash flow into contractual, programming, pricing, valuation, economic and technological factors while Okemah (1999) grouped them into external and internal factors.

All of them discovered that accuracy of cash flow forecast was difficult to achieve due to certain requirements. These requirements were recognized by Odeyinka (2003), Odeyinka and Ojo (2007), Odeyinka et al. (2008), Babalola and Ojo (2010), Ojo (2010) as risk factors. These authors assessed the risk factors as they affect cash flow prediction by either clients or contractors in general.

Some studies on cash flow prediction revealed that the predictive ability of cash flow models had been hampered by host of factors which include project characteristics. Odeyinka and Lowe (2000, 2001) found that a more accurate modeling of cash flow forecast that takes risks and uncertainties into consideration would need to consider differing project groupings. Skitmore (1992) also found that segregating cash flow data into differing project groupings significantly improves the predictive power of developed models. These project characteristics included type of client, type of project, project size; project duration and procurement method. According to Skitmore, the result of his study established the need for due consideration of project characteristics during risk management of project at early stage especially cash flow preparation stage by the clients.

2.6 LITRATURE SUMMARY

The literature is organized to see the general concept of about construction cash flow management, its importance to construction projects, how cash flow forecasting is being practiced in the industry, and what strategies to follow to minimize cash deficit during construction stage actively and proactively, and finally the major factors to be considered and which affect cash flow predictions. Many studies are made internationally about construction cash flow management with different titles and objectives. The researcher has tried to see some of them which are important for the specific title of this project and the researcher believes that some knowledge about the subject matter is gained.

The methodology of this project focuses on the above main points to see the gaps in the local practice. Specifically, the survey identified from literature includes: the need for cash flow forecasting, and various approaches for resolving deficit cash flows. It also identified factors affecting cash flow predictions as well as its impact on project performance. The questionnaire identified further various cash forecasting models if any that are in use of the local practice. The data collection and discussion of the findings are described on the next chapter of the paper.

3. DATA COLLECTION AND DISCUSSION OF FINDINGS

3.1 DATA COLLECTION

The data collection approach adopted for conducting this project includes both primary and secondary sources. Questionnaire and interview provide the primary data for this thesis while the secondary data sources include civil engineering journals those especially in project and construction management and internet sources on cash flow issues of various construction works overseas. These different methods of data collection have been used in order that the data or information obtained from one can be supplemented by the others whereby the collected data will give multiple evidences.

Questionnaire provides direct information for the subject matter of a research as it is focused on issues which further serves as a survey to understand the main concerns and attitudes of respondents towards the problems. The preliminary data for this project is collected from questionnaire survey from five selected local grade 1 construction companies. Two experienced professionals working from each of the five construction companies are requested to fill the forms with live discussions.

The survey, identified from literature includes: the need for cash flow forecasting, and various approaches for resolving deficit cash flows. It also identified factors affecting cash flow predictions as well as its impact on project performance. The questionnaire identified further various cash forecasting models if any that are in use of the local practice.

The questionnaire produced information regarding the firm's annual turnover of the past five years, organizations experience in building construction, number of projects at hand and year establishment which enables us to estimate in general the firms' capacity and work volume (Table 1). The response rate for questionnaires is 100% as the number is small and the survey was conducted live and forms are filled with interview. It took six days to finalize collecting of data.

Interview is one of the primary data collection methods which is flexible and adaptive way of investigating underlying motives of a subject in a way that self-administered questionnaires cannot. The interview undertaken for this thesis was based on semi structured style. This type of interview has a predetermined set of questions (generalized form of questionnaire) with a flexible order depending on what the interviewer perceives the subject matter by looking at the respondent capability and exposure or experience. The interview for this thesis was made with four reputed professionals of the sector. From these interviewed professionals, two of them are from consultants', the two others are from client side (university projects) and the remaining one is a construction company chief accountant who has direct exposure in administering different construction companies' cash flow.

Table 1: Surveyed construction firms' status

Type of information	Construction Companies surveyed				
	A	B	C	D	E
Average turn over the past five years in birr	0.80 billion	0.85 billion	0.74 billion	0.70 billion	0.67 billion
Experience (in years) of the company in building construction projects.	20	16	12	14	15
Year of establishment in E.C.	1988	1992	1996	1994	1993
Number of building construction projects at hand at this time.	18	22	12	10	7

3.2 NEED FOR CASH FLOW FORECASTING

Asper the structured questionnaire assessment, the five construction companies were asked for the importance of cash flow forecasting for construction projects. All the respondents from the contractors' side have the same ground with regard to the need for cash flow management for construction projects that it is very important.

3.3 USAGE OF CASH FLOW FORECASTING METHODS

One survey was carried out to investigate the usage of various cash flow forecasting methods by the companies that are identified from literatures. The result of the survey is shown in table 2 below. The result of the table shows the major methods adopted for cash flow forecasting seems (not totally the same and impossible to differentiate) the use of computer spread sheet and the detailed approach (breakdown of bill item into cost/schedule).

Table 2: Extent usage of cash flow forecasting methods

Ser. No.	Forecasting Method	Companies Surveyed					Remark
		A	B	C	D	E	
1	Spread sheet	x	x	x	x	x	
2	The detailed approach (break down of bill items into work/schedule)	x	x	x	x	x	
3	Value approach (based on project value)						All the surveyed companies are not using these methods and even don't have any idea.
4	Cost approach (based on cost of input resources)						
5	Short cut approach (using models/library of S curves based on past similar projects)						

It has been tried to assess to what degree of detail they are using the cash flow forecasting methods. Almost all the construction companies are preparing the cash flow forecast for contractual purpose only that is production of S curve for the sole use of the project owner or client. Even though they are using these types of forecasting methods, it is not detailed enough and doesn't consider the actual time in which cash is collected from the client when payment is made to creditors and subcontractors.

From the surveyed construction companies, one of them is using cash flow management system which is developed by the company's IT department for in house use of finance department only. The system is developed to generate summarized daily, weekly and interim cash balance reports just for the consumption of the company general manager for very short

term periods. It uses cash in from a very recent (not more than 15 days) cash collections from projects. It also produces status of liabilities or payables for creditors. It lacks many inputs as it is not linked with engineering department plans so it is impossible to take this as practice of cash flow management.

Theoretically and as evidenced show from literature international practices, mostly 12 months' time span or planning time should be considered company wise in preparing construction cash flow forecasts. Here as surveyed to investigate the local practice, construction companies produce cash flow of S curve by their engineering teams and it is not integrated and coordinated with other functional departments to reach on a reasonable forecasts. The S curve shows only either cumulative cost or revenue. Normally, the cash flow diagram incorporates periodic and cumulative construction revenue (interim payment collections), periodic and cumulative expenses (expenses should be categorized based on time of pay out the cash i.e. at the start, prorated or at the end of the period in consideration) and periodic and cumulative cash balances throughout the time of the project.

However, the ground here is surprisingly different and there is no a single company out of the five selected ones which we can confidently say they are producing cash flow forecasting properly for cash flow management. On the contrary, it will be difficult to generalize that the practice is not well implemented in the local construction industry with this very little number of sampling.

From the study, 80% of the surveyed companies are almost managed by one man management (by the owners) and with regard to cash it is found that the owner is the only one who decides and they don't want to lay a clear system of managing the company's cash. During discussions with some selected expertise in the field, they pointed out that the main reason why the owners do not want to use a cash flow system is that they are spending advance and interim payments given by their client to some other investment or personal expenditures rather than for the specific project under contract. On top of that, they decide on purchasing machineries without knowing the actual cash flow of the project which in turn drains the working fund

necessary to run the project and as a result the project will be in danger. Due to these and others reasons it will be reckless to expect proper cash flow management implementation in short period of time in the local construction industry.

It is found out that one of the construction companies out of the fives is working to implement an integrated approach of resource planning practice named ERP (enterprise resource planning) which can improve planning practice and cash flow forecasting to manage construction cash flow properly. And this may be taken as an exemplary and a good start for the local construction industry if implementation is realized.

3.4 ALLEVIATION OF CASH FLOW DEFECIT

Another survey was carried out to evaluate the extent of usage of various strategies for resolving deficit cash flow. These mitigation methods are just taken from the reviewed literatures. Table 3 summarizes the result of the survey. The companies were also requested to give rank on what method they are using for resolving deficit cash flow and responded as tabulated below.

Table 3: Cash flow deficit resolving strategies

Ser. No.	Mitigation Method	Companies Surveyed and rank given by them on the extent usage of the methods					Remark
		A	B	C	D	E	
1	Company's cash reserve	6	6	6	6	6	
2	Tender unbalancing	1	3	1	2	1	
3	Delayed payment to subcontractors	5	4	4	4	4	
4	Delayed payment to suppliers	4	5	5	5	5	
5	Reduce delay of interim payments from client	2	1	2	1	2	
6	Borrowed funds	3	2	3	3	3	
7	Develop realistic, well-considered budgets for each project	7	7	7	7	7	

Key for the ranks given

1. Very highly preferred
2. Highly preferred
3. Preferred
4. Moderately preferred
5. Less preferred
6. Very less preferred
7. Not preferred at all

As shown from the result of the survey on the mitigation method, all the companies are not using their cash reserve in solving their cash deficit. They all ranked it 6th. It is assumed that the reason why they are not using their cash reserve can be the diversification of their company in to other related business firms. Unfortunately more than half of the companies surveyed have found to establish sister companies which seems have direct relations to the prime company. It is also argued that may be they are investing on these companies which as a result couldn't allow them to use their cash reserve.

Most of the surveyed companies rely on as much as possible on early collection of money from the approved payment by the client. This strategy is ranked 1st and 2nd by all of them. It is found during survey that some of the companies have established on department level for collection of interim payments from clients. The department is responsible for following payment from its initiation at project up to the collection from the client.

The other finding of the survey is that all companies are not using the 7th method which is proactively action taking mechanism based on developed realistic cash flow forecasting for their projects. They usually face cash deficit without their prior or in advance knowledge of the problem as it clearly shown on their practice. It is clear that if they work hard on the detailed planning for forecasting cash flow, they can be prepared for the deficit and as a result they will act carefully on unwanted expenditures and will look for fund in advance. The gap on this strategy is one of the main finding of this project and it is believed that it is very crucial for the local industry.

66% of the respondents ranked tender unbalancing (front loading) 1st for possible cash deficit resolving at the early stages the project. Tender unbalancing involves the contractor's marking up prices on quantities that are scheduled for early completion trading off quantities for late completion (Arditi and Chotibhongs, 2009; Skitmore and Catelli, 2011). From an efficiency perspective, the problem with front loaded tender is that the client will make the payment to the contractor earlier than in a situation with full information about the cost. This strategy has a dimension of risk to it, which has to do with price manipulation at the tendering stage [9]. From

tender unbalancing (front loaded) the contractor may benefit positive cash flows at the earlier months, but if the money is not properly allocated on the project, the project may suffer at the finishing stage and may bring unwanted consequence and delays.

From the study, 80% of the respondents give rank for payment delay to subcontractors at stage 4. This is a good strategy as one of the objective of subcontracting is to finance the project next to need for specialization. During discussions on the survey this strategy could have been ranked 2nd or 3rd but some special subcontractors do not give enough time and want to be paid as early as possible since they have bargaining power. That is why delaying subcontract payment is ranked 4th by most of the respondents.

Like delaying payment of subcontractors, delaying of suppliers payment is ranked 5th by most of the respondents. Here one of the argument is most suppliers are not patient not cooperative to wait until the contractors get payments.

Other findings of the study in regard to mitigation of cash deficit is the relationship of contractors with suppliers and subcontractors. The issue of cash flow raises questions about how a company could deal with it. If company survival is to do with cash flow, a contractor should be able to manipulate the payouts, in order to hold more money for longer. However, it is clear that this way of raising working capital only passes bigger problems down the supply chain.

It was mentioned on previous part of the questionnaire that some construction companies are establishing sister companies which has direct relation with their prime company. The other reason here why they establish is that most suppliers and subcontractors are working with the contractor's money and this is exposing them for cash shortages. Basically, one of the aim of subcontracting is to finance the project. But, the situation here is totally different and contradictory. As an example most of suppliers and special subcontractors are paid 50% of their contract amount up on signing of the contract without doing anything.

So, the construction companies here are forced to manage the import issue to their project by their money and also engage on special works. For that they will establish a sister company doing this additional business. This has both negative and positive effect on their cash flow management. The negative effect is that, when the prime company is diversified this is an investment and it will affect working capital of the prime company. The positive part is that the owner of the construction company will retain the money by not subletting the work to other company and if the established sister company is fit enough it can be source of cash by doing other works to other clients. This serves in some way as a strategy to minimize cash deficit of the construction company in the future as one of the construction company owner underscored during the survey.

Construction companies should have clear strategies to create a very good relationships with suppliers and partnership approach with their special subcontractors so that their projects will be financed and cash deficits can be minimized.

During discussions between some selected reputed professionals in the field, they have pointed out major causes or reasons for cash shortages during execution of a project. Improper utilization of advance payment (disbursing it somewhere that is not specific to the project use), Poor practice of forecasting or planning, delay of client payment and price escalations are among the major ones exposing a project to cash shortages.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

Construction industry takes a big share of the country's budget. It also presents high levels of insolvency and failure for this sector is a serious problem for the development of the country. As it is presented on the literature review part, one of the major causes of failure for the sector is bad cash flow management emanating from poor planning practice.

Based on this, the researcher looked into cash flow management practice in the leading local construction companies participating hugely on building projects. Essentially, the paper has investigated issues like: the need for cash flow forecasting, the methods deployed in forecasting cash flows and extent usage of cash flow deficit minimizing strategies in the selected construction companies' custom.

Finally, the following concluding remarks are forwarded based on the result of the survey:

- 1) Cash flow forecasting and management are perfect tools to avoid risk of incompleteness of construction projects due to shortage of fund as all the surveyed companies stamped their five fingers for agreement on the issue.
- 2) Even though there are plenty of cash flow forecasting methods and models in use abroad, the methods found in practice here locally are using spread sheets and the detailed approach (break down of bill items into work/schedule) incompletely i.e. they are using these methods to generate S curves which shows either cumulative cost or cumulative revenue. The S curve uses solely to the client for budgeting and it doesn't show the cash out, cash in and cash balance with proper timings.
- 3) Improper utilization of advance payment (disbursing it somewhere that is not specific to the project use), Poor practice of forecasting or planning, delay of client payment and price escalations are among the major ones exposing a project to cash shortages.
- 4) With regard to proper usage of cash flow forecasting method for construction cash flow management, the paper generally concludes that the local practice is very poor.

- 5) Most of the constructing companies are not using their cash reserve in solving cash deficit problems rather they rely on borrowing funds from banks or other financial institutions. Besides, tender unbalancing (front loading) is also found to be their favorite approach or strategy to solve cash flow problems even if it has some risks on them.
- 6) It is found that delaying payments of suppliers as a strategy for solving cash deficit in construction creates a problem on supply chain as there are no potential capable suppliers who can wait for contractor's payment for so long. Some suppliers are also found using their high bargaining power to influence the contractors not to delay their payments.
- 7) Some construction companies are found to be forced to establish sister companies doing imports and specialized works to assist the construction company and to serve as a strategy in minimizing cash flow deficit during construction.

4.2 RECOMMENDATIONS

As mentioned earlier, one of the main objective of this paper is producing recommendations to minimize the gaps identified during the study time. Accordingly, the following recommendations are forwarded that can contribute a lot on the construction industry practice.

1. As deficiency of cash is one of the main factors threatening the success of construction projects and causing business failure, an appropriate cash planning technique is necessary for adequate cost control and efficient cash management to reduce the risks and uncertainties of the construction project. Contractors need to work hard on laying clear guideline on cash flow management practice and should closely follow up the implementation by establishing planning and monitoring team responsible for the work. The planning team should also properly prepare plans to identify future shortages and regularly revise it for any deviations during execution by monitoring expenditures.
2. A construction company should ensure the proper usage of the project advance payment and interim payments for the sole purpose of project progress and should avoid spending the money elsewhere so that the project will not suffer on cash shortage in forthcoming.
3. Continuous training on application soft wares which can assist cash flow forecasting is mandatory to properly implement cash flow management in construction projects. Construction schedules and plans for a construction project should be prepared with actual quantities of work volume by preparing take off sheets before commencing the work so that cash forecasts will base accurate expenses of construction inputs.
4. Contractor's cash flow forecast and cash flow diagram should be included in the special condition of contract then the client will be aware of which time the project

will be in short of cash and develops confidence on its timely completion. This helps to take joint actions with the contractor so that any projected problems can get solution in advance. The consultant should also work hard on timely submittal of the forecast by the contractor and communicate this to the client.

5. The researcher has tried to assess cash flow management practice associated with the local construction industry. It is believed a further work on the area is vital in order to guide the construction industry with efficient implementation of construction cash flow management. Accordingly, the following topics are selected for further investigation :

- Assessment of construction cash flow management and its impact on project completion.
- Assessment of cash utilization of some selected contractors' and its impact on cash flow management.
- Construction cash flow management and contractual relationships between client and contractor, focusing on public building projects like educational facilities.
- Construction cash flow management and relationship between suppliers and subcontractors , focusing on complex building construction projects
- Impact of inflation and price escalation on construction cash flow management of building projects.
- Assessment of construction cash flow practice of local construction companies and foreign construction companies participating in the local industry.

8. REFERENCES

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APPENDIX – A

Questionnaire !!!

Dear Madam / Sir,

I am undertaking a research entitled “**Construction Cash Flow Management Practice In selected Leading Local Construction Companies**” for the partial fulfilment of the requirement of master degree in civil engineering stream of construction technology and management.

This survey is part of academic research that aim to assess the Current practice of construction cash flow management in the local construction industry. The primary objective is to identify the gaps in the local practice from the international accepted rehearses and propose recommendations that help progress the local practice for better project performances.

You are chosen as one of the best construction company or candidate to participate in my research by answering the closed and semi-closed questionnaires related to the title. I appreciate your valuable contribution from your experiences in the field of construction engineering by completing all questions by taking your valuable times. All the information you provide will be kept in strict confidentiality and it will be only used for academic purpose only.

Sincerely,

Kassahun Mereawi

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Part I: General Information and Experience

1. Name: (optional) _____
2. Company name _____
3. Email _____
4. Gender _____
5. Which organization do you represent
 - Client ☐
 - Consultant ☐
 - Contractor ☐
 - Others ☐
6. Please mark you Designation in the company below
 - Owner ☐
 - Project manager ☐
 - Engineering Department manager ☐
 - Deputy General Manager ☐
 - Finance manger ☐
7. Year of establishment in E.C. of the company you have been working
(Please specify the establishment year in EC here)
8. Total experience in years of the company you have been working in building construction projects.
(Please specify the total years of experience here)
9. Average annual turnover of the company you have been working for the past five years.
(Please specify the amount in Ethiopian birr here)
10. Number of building projects at hand currently
(Please specify the number of projects here)

Part II: Need For Cash Flow Forecasting

Cash flow forecasting according to McCaffer (1976) provides a good warning system to predict possible insolvency.

1. Please rank the need for cash flow forecasting for a construction company

1.1 Not important

☐

1.2 Less Important

☐

1.3 Moderately important

☐

1.4 Important

☐

1.5 Extremely important

☐

2. Please foreword any other additional point or opinion for the subject matter; like how it is important for the industry...

Part III: Extent Usage Of Cash Flow Forecasting Method

1) Please give rank to the degree usage of construction cash flow forecasting method your company uses for managing building construction projects undertaken.

1. = Usually
2. = Sometimes
3. = Once
4. = Don't use any more

Ser. No.	Type of cash flow forecasting method	1	2	3	4
1.1	Spread sheet				
1.2	The detailed approach (break down of bill of items into work/schedule)				
1.3	Value approach (based on project value)				
1.4	Cost approach (based on cost of input resources)				
1.5	Short cut approach (using models/library of S curves based on past similar projects)				
1.6	Integrated systems (e.g. cost/schedule integration)				
1.7	Cybercube (developed in the UK)				
1.8	TASC (the advanced S-curve)				
1.9	FINCASH (developed in Australia)				
1.10	Others , please specify				

- 2) What is your perception towards the use of detailed cash flow forecasting method practice in the local construction industry?

- 3) What is your general comment regarding cash flow forecasting method and what do you expect in the future?

Part IV: Extent Usage Of Cash Flow Deficit Mitigation Strategy

According to Cooke and Jepson (1986), 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.

1) Please give rank to the degree of usage of cash flow deficit minimizing strategy.

- 1. = Usually
- 2. = Sometimes
- 3. = Once
- 4. = Don't use any more

Ser. No.	Cash Deficit mitigation strategy	1	2	3	4
1.1	Company's cash reserve				
1.2	Tender unbalancing				
1.3	Delayed payment to subcontractors				
1.4	Delayed payment to suppliers				
1.5	Reduce delay of interim payments from client				
1.6	Borrowed funds				
1.7	Develop realistic, well-considered budgets for each project				
1.8	Other methods you use if any _____				

- 2) If you have any comments regarding cash flow deficit minimizing strategy , please specify here:

- 3) What is your general comment or opinion in regard to relationships of your company (a company you are working with) with suppliers, subcontractors and equipment rental for solving cash deficit?

Thank you for your cooperation!!!!