S-curve Characterisation of Contractors' Cash Flow in Nigerian Tertiary Institutions Tetfund Projects

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Abstract

It was empirically established that 82% of businesses fail due to poor management of cash flow; and that just over half of businesses prepare cash flow projections and compare them with actual figure. The paper established the characteristics of contractors' cash flow handling TETFUND projects in Nigerian Tertiary Institutions with a view to improving financial control in construction using the S-Curve as a tool. The research was exploratory in which cash flow characteristics of three selected projects were established. Project records comprising of project profiles and cash flows were used to generate data for the study. The characteristics of the S-Curves of two of the projects depicted rapid initial start-up indicating engagement of many activities at the beginning, while the third project depicted slow start-up due to unavailability of results of soil test. Subsequently, all the projects recorded average progressions and toward the end, progress of all the projects became slow. All the projects were largely executed under negative net cash flows with one at loss. It is therefore recommended that S-Curve be employed in financial planning and management in executing TETFUND projects in order to project ahead financial commitments and implications required in executing projects. The major limitation of the research was restricted case studies due to confidentiality on financial data.

Keywords: *Cash Flows, Infrastructural Projects, S-Curve, Tertiary Institutions, TETFUND.*

Introduction

A construction company is a risky venture (Peterson, 2009). This is highlighted by Harris and McCaffer (2001) reporting that "each year the construction industry usually experiences a proportionally greater number of bankruptcies than do other industries". While it can be said that bad luck may play a part in some business failures, lack of reliable financial information also plays a part in most business performances (Barrow, 2008).

It is therefore imperative for construction companies to keep accurate costs for each and every project they handle. In this premise, Nunnally (2011) pointed out that "the principal objective of project cost control is to maximise profit while completing the project on time at satisfactory level of quality." Proper cost control procedures result in the accumulation of historical data, which are invaluable in bidding, estimating and controlling future project costs (Peterson, 2009; Nunnally, 2011).

The success of project cost control mechanism depends largely on initial cash flow forecast. Harris and McCaffer (2001) strongly advised for cash flow forecast and that it must be done regularly and the method employed must be simple and accurate. S-curve has been recognised as one of the simplest tools for cash flow forecast and control in construction. It is a cumulative cost graph for a project which links time and cost elements of a project (Oberlender, 2000). Gould (1997) noted that "by integrating cost information from an estimate with timing information of a schedule, the cash needs of company can be closely examined."

Ciel (2011) added that "an understanding of S-Curve theory and its analyses will help learners and team members grasp the importance of monitoring the progress and growth of an ongoing project – at a specific stage or percentage completion." It is also used to represent the utilisation of resources over the proposed time of the project.

Chao (2013) revealed that "project control in construction commonly uses the S-curve that represents a project's cumulative progress overall, so obtaining a reasonable S-Curve has always been deemed important." This buttressed the assertions of Halpin and Woodhead (1980) and Gould (1997), respectively that; 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; and that cash requirement and income projections should be done for all company projects since most companies have projects at different stages of completion – those requiring an influx of cash can be helped by other projects which are nearing completion and generating positive cash flow.

The aim of this paper is to establish the characteristics of contractors' cash flow handling TETFUND projects in the Nigerian Tertiary Institutions with a view to improving financial control in construction using the S-Curve as a tool. This becomes very essential not only on the contractors' business interest in making profit but also in the quest for adequate management of available financial resources. Oscar (2012) reported that the major challenge against effective management of universities in Nigeria is inadequate funding. No wonder that the Nigerian government has over the years not met the UNESCO recommendation of 26% annual budgetery allocation to education sector, as remarked by Ajayi and Ekundayo (2006).

Literature Review

Financial Planning and Management in Construction

Nunnally (2011) explained that "financial planning for a construction project includes estimating prior to bidding or negotiating a contract, casting project income and expenditure (or cash flow) and determining the amount of work that a construction can safely undertake at one time."

Basha *et al.* (2016) noted that cash issues are various and complicated. Cash is the most crucial of all the project resources and its relevance in construction is further pointed out by Gould (1997) that "cash link people and equipment" and that it is a resource that must be prudently managed on a project." In the same vein, Nunnally (2011) noted that "the financial management of a construction company is as important as is its technological management." To illustrate this, the author reported that 80% of construction company failure in the US was as a result of inadequate financing, underestimating costs, inadequate cost accounting and poor management. Basha *et al.* (2016) further reported that over 60% of contractors' failures are due to economic factors.

Moreover, Harris and McCaffer (2001) revealed that one of the final causes of bankruptcy of contractors is inadequate cash resources and failure to convince creditors

and possible lenders of money that inadequacy of cash during construction is only temporary. For this reason, Gould (1997) recommended that both client and contractor need to know with accuracy, how much cash must be available each month of the project to pay the contractor's invoices. The contractor also needs to be able to predict its cash for a project." This is imperative because Business Development Bank of Canada (BDC) (2014) revealed that "just over half of businesses prepare cash flow projections and compare them with actual figure.

Cash Flow and Cash Flow Management in Construction

According to Harris and McCaffer (2001), Goodrich (2013), Team Free Management eBooks (FME) (2013) and Revere Bank (2014), cash flow is the transfer or movement of money into or out of a company or business, especially as it affects liquidity (essentially due to some non-cash items). "Cash flow and profitability are interactive, even though they are different issues" (Halpin and Woodhead 1980; Basha *et al.,* 2016). However, Harris and McCaffer (2001) categorically mentioned that "there is evidence that some smaller companies confuse profit flow with cash flow," which resulted into "misleading calculations."

Therefore, it is imperative that companies understand how to efficiently manage their cash flow in order to stay in business (Gould, 1997). Revere Bank (2014) and Ward (2015) reported, respectively that "in fact, not effectively managing cash flow is one of the main reasons that almost two-thirds of small businesses end up closing their doors within two years," and that "82% of businesses fail due to poor management of cash flow."

Management of cash flow is made difficult by the fact that payments in construction are made in different increments depending on payments arrangement with client and the type of activities involved in the project (Halpin and Woodhead 1980; Gould, 1997). Generally, Harris and McCaffer (2001) identified duration of project, its profit margin, retention condition on the project, delay in receiving payment from client, credit arrangement with suppliers, plant hirers and subcontractors, phasing of the projects in the company's workload and Settlement of outstanding claims as the factors affecting cash flow in construction.

According to (Gould, 1997; Peterson, 2009), dealing with retention and progress payment among others is one of the challenges facing the industry, making management of cash difficult. This portrays

the relevance of cash flow forecast. Peterson (2009) opined that operating construction company require a specialised set of financial management skill (which involves estimates and cash flow forecast) due to the unique nature of the construction industry. Accordingly, Jackson (2010) stated that "the consequences of any errors or omissions in any estimate are borne by the contractor, and the contractor will not actually know what the true cost of the construction is until project is complete."

However, Harris and McCaffer (2001) revealed that some companies argued that "forecasts are guesses and therefore are probably wrong and useless and not worth the effort." Conversely, it is objectively "the results of calculations based on the information available at the time and a few assumptions as to what will happen" (Harris and McCaffer 2001). These calculations are normally undertaken at the project level and at the company/division/area levels.

i. At the Project Level

   The first level of cash flow forecast is done at the estimating and tendering and execution stages for an individual project. Basha *et al.* (2016) indicated that this is necessary for the contractor to understand the demand for money to meet the project cost and the pattern of income it will generate and also to make sure that their planned cash funding is sufficient to cover any possible financial deficit of the project.

ii. At the Company, Division or Area Level

   This involves aggregating cash flows for all active projects which is recommended to be executed regularly every quarter of the year or every month. This is relevant because cash flows from some can be used to finance other projects.

For effective cash flow calculation, relevant data must be available. Such data according to Harris and McCaffer (2001) include; graphs of value versus time (amount receivable by the contractor) and that of cost versus time (contractor's costs liability); measurement and certificate interval; payment delay between certificate and actual receipt of cash; and retention conditions and retention payment arrangement. Others are; project cost broken down into items; and delay between incurring a cost liability under each cost heading and meeting that liability. Plotting graphs of values versus time and cost versus time together results into detailed S-Curve

for cost monitoring and control.

Cash forecast is necessary to avoid any financial problem such as cash crunch during project progress. It essentially, among others thing helps in managing working capital during construction. Business Development Bank of Canada (BDC) (2014) indicated that effective cash flow management can help not only to avoid cash flow crunch but also provide invaluable insight into the business itself. Basha *et al.* (2016) pointed out that cash flow management in a contract is balancing of expenditure by the contractors throughout the project with his expected available funds.

According to Revere Bank (2014) cash flow problems always happen in a company's lifetime, and if a business owner does not plan for them, they can place a huge strain on the business or even shut down operation. Thus, Harris and McCaffer (2001) concluded that "cash flow forecasting provides a valuable early warning system to predict possible insolvency." This enable preventive measures to be considered and taken in good time such as; not taking on new contract altogether; re-negotiation of overdraft; adjustment of work schedules of existing contracts; negotiation of extended credit with supplies; and accepting suppliers' full credit facilities.

S-Curve and its Application in Cash Flow Management

Halpin and Woodhead (1980); Gould (1997) stated that the projection of income and expense during the life of a project can be developed from several time-scheduling aids used by the contractor. The sophistication of the method adopted usually depends on the complexity of the project. The most commonly used and simplest method is the so-called S-Curve (Gould, 1997). It is a graphical presentation of the cumulative expenditures over time (Halpin and Woodhead 1980). It is called S-Curve because it resembles the shape of the letter 'S' (Oberlender, 2000) – assumes the form of a 'lazy S' (Halpin and Woodhead 1980).

S-Curve is simple and easy to comprehend and has long been widely used in construction as tool for project schedule control (Chao, 2013). Halpin and Woodhead (1980) explained that, an S-Curve can be developed by contractor by constructing a simple bar chart of the project, assigning costs to the bars and smoothly connecting the projected amounts of expenditures over time (with cumulative *cost* on the y-axis and

time on the x-axis). The graph links two of the basic elements of project, time and cost (Oberlender, 2000). S-Curve can also be developed from other planning techniques such as CPM and PERT. In fact, (Nunnally 2011; Oberlender 2000) revealed that "the use of CPM procedures also makes it easy to determine the effect on cash flow of different projects schedules (early start, proposed/target and late start)."

For an S-Curve to be effectively used as tool for balancing expenditure and income, the components (expenditure and income) are normally plotted on the same graph. The plots serve as tool for cost control as they identify cost and progress by project work element and progress payment to the contractor (Halpin & Woodhead, 1980; Nunnally, 2011). Ciel (2011) added that "as a tracking tool, comparisons of different S-Curves against the standard S-Curve (proposed) help in monitoring the growth or progress of the project." Thus, Gould (1997) identified 'Payment Project' and 'Income Projection' as the two of S-Curve components plotted against time.

However it should be noted that the 'Payment Project' (cost) component is what actually constitutes the S-Curve. Figure 1 shows a typical example of S-Curve with cost and both expenditure and receipts plotted against time.

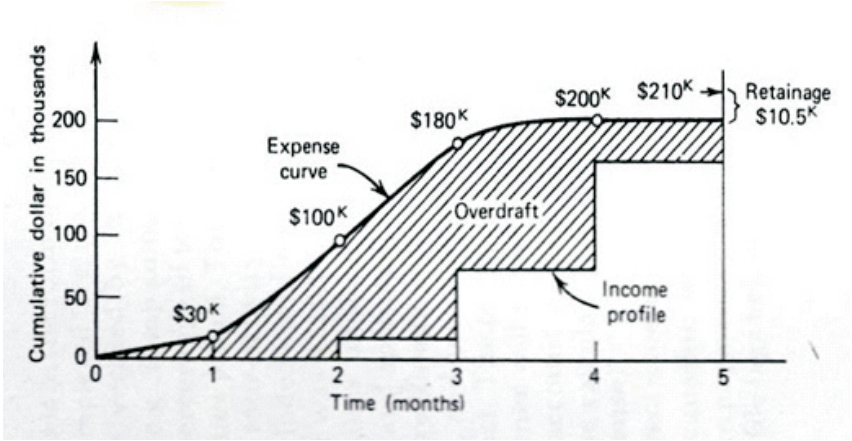

Figure 1: Typical S-Curve
Source: Halpin and Woodhead (1980)

In Figure 1, the curve marked 'Expense curve' is actually the S-Curve which presents the cumulative expenditure encountered by the contractor, while the step-like curve marked 'Income profile' depicts how payments are received by the contractors, also cumulatively. Halpin and Woodhead (1980) and Basha *et al.* (2016) explained the relevance of the area bounded by these two curves. If the area is below the S-Curve (expense curve), the net cash flow is negative; whereas if the area is above, net cash flow is positive. Basha *et al.* (2016) explained that net cash flow is the difference between positive (inflow) and negative (outflow) cash flows. (Figure 1 generally exhibit negative cash flow).

As a guide to cover the difference between project income and expenditure, Nunnally (2011) disclosed that "it has been found that most construction contracts require a minimum working capital of about 10% of the contract value." This can only be known and maintained if proper projections were made at planning stage.

Payment Projection (Payment/Cash Requirements Curve) and Income Project (Schedule of Value Curve)

This curve projects the cash payable by the contractor for the project (Gould, 1997). Payments typically include payment for labour, materials and sub-contractors among others. It is pointed out by Gould (1997) that payments in this respects, "should be the direct costs, not including general overhead or profit" and that "the income received by the contractor is the amount less retainage."

The normal retainage is 5 to 10% of the amount involved (value reflected in the valuation certificate). In developing S-Curve, the value of the income plot equals the values in the schedule of value less retainage. At the end of the project the final point on the cash requirements curve will indicate the total amount the contactor spent, while the income curve reflects the total amount paid to the contractor by the owner. Thus, the difference between the two curves is the money to pay for general overhead and provide for profit.

S-Curve Characteristics of Construction Projects

In construction, the S-Curve represents the cumulative progress of a project from starts to finish and its slope indicates the progress per unit (Chao, 2013). Its slope is usually small at the beginning, gradually increases to the maximum at the inflection point, and then decreases towards the end Halpin and Woodhead (1980) further explained that the

general shape characteristics of an S-Curve curve are due to the fact that early, in most projects, when activities are mobilizing the expenditure curve is relatively flat. As many activities come on-line, the level of expenditure increases and the curve has steeper middle section. Toward the end of the project, as activities wind down so expenditures again flatten. Chao (2013) added that "the shape shows changes in progress from being slow to fast and slow again, which is due to the distribution of work peaking at certain stage when the work is relatively concentrated."

On the other hand, in most S-Curves, income profile lags behind the expense S-Curve as a result of delay in payment of billing by the owner and the retainage withheld (Halpin & Woodhead 1980). By graphically representing such situations, a contractor can understand progressive cash requirements of a project which will also assists in decision on how to source for the required finance. However, the reliability of the graphical representation of project cash flow by S-Curves depends largely on the accuracy of forecast. S-Curve is simply a graphical illustration of cash flow forecast. Similarly, Chao (2013) noted that position of the inflection point of S-Curve indicates where progress peaks; and its slope indicates the extent of concentration of project progress. This link them with project schedule performance and are therefore influenced by project condition.

Research Methodology

Exploratory approach was adopted for the purpose of this research. It involved establishing cash flow characteristics of selected infrastructural projects in Nigerian tertiary institutions under TETFUND by comparing expenditures and receipts using the principles of S-Curve.

Projects' records were used to generate data for the study. Data collected comprised of projects' profiles, cash inflows and cash outflows records of the projects. Projects' profiles involved projects' descriptions, scopes, dates of contracts award, contracts sums, contracts durations, dates of sites handover to contractors and expected dates of handover after completion, where applicable.

Data pertaining to cash inflows included number of valuations and payments for the periods of projects' execution, dates of payments and amounts of respective valuations and payments. On the hand, cash outflows records comprised of monthly expenditures records and total amounts

involved in each month.

A purposive sampling criterion was adopted for the research. This became necessary due to inaccessibility of financial data from firms handling projects in the institutions located in the study area. Despite several TETFUND construction projects going on in the institutions, only three firms ventured to provide the required financial data.

Profiles of projects were presented in descriptive manner. Financial records were presented in tabular format. For the purpose of analysis, cumulative figures for both cash inflows and cash outflows for each project were calculated. This was necessary for plotting of corresponding S-Curves for each project. Inferences were drawn from the generated S-Curves in descriptive manner.

Results and Discussion

Project Profiles

The three projects whose data were made available to this study were two extension projects through TETFUND 2011 BOT Special Intervention at Federal College of Education, Zaria; and Construction and Furnishing of twin theatres at Ahmadu Bello University Teaching Hospital, Zaria.

The first extension project involved conversion of a bungalow-styled block of offices, classrooms and laboratories into one-storey block. The work covered sub-structure, super-structure, finishing, roof work, electrical installations, mechanical installations, external works and landscape. The contract was awarded on 24th September, 2012 at a contract sum of N125, 988,487.72. The contract duration was 30 weeks (24th September, 2012 to 8th March, 2013). Records indicated that the site was handed over to the contractor on the 24th September, 2012. The project was actually completed on 11th December, 2013 (9 months beyond the contract duration).

The second extension project comprised of conversion of bungalow-styled block of offices, classrooms and laboratories into one-storey block. The work also covered sub-structure, super-structure, finishing, roof work, electrical installations, mechanical installations, external works and landscape. The contract was awarded on 12th September, 2012 at a contract sum of N123, 041,826.06. The contract duration was also 30 weeks (20th September, 2012 to 4th March, 2013). Records indicated that the site was handed over to the contractor on the 20th September, 2012, however the project was actually completed on 22nd February, 2014 (11 months beyond the contract duration).

The third project was awarded at a total sum of N211, 285,161.73. The duration of the contract was originally 28 weeks. Site was handed over to the contractor on 9th November, 2012 and it was anticipated that the project would be completed on 3rd June 2013. However, it was revealed that due to certain fault of the client, an extension of 11 weeks had to be approved. This moved the expected date of completion to 19th August 2013. Moreover, it was revealed that due to inclement weather condition the completion

S-Curves and Cash Flow Analysis

Table 1 presents cash inflows for the first extension project at Federal College of Education Zaria. It can be depicted from the table that 15% of the contract sum was paid in November 2012 as advance (mobilization fees). Five subsequent payments were made based on valuation. As at the end of the 6th valuation, 95% was paid to the contractor indicating that the remaining 5% was retained as retention.

Table 1: Cash Inflow for the First Extension Project at FCE, Zaria

S/No	Date	Valuation No	Amount in Valuation (₦)	Cumulative Cash Inflow (₦)
1	November 2012	Advance	18,898,273.17	18,898,273.17
2	January 2013	1st Valuation	24,440,347.03	43,338,620.03
3	May 2013	2nd Valuation	12,952,211.99	56,290,832.02
4	July 2013	3rd Valuation	33,724,311.94	90,015,143.94
5	January 2014	4th Valuation	16,984,070.67	106,999,214.60
6	March 2014	5th Valuation	12,689,848.72	119,689,063.32

Source: (Field Survey, 2014).

Table 2: Cash Outflow for First Extension Project at FCE, Zaria

S/No	Date	Amount (₦)	Cumulative Cash Outflow (₦)
1	October-November 2012	12,800,450.00	12,800,450.00
2	December 2012-January 2013	40,400,000.00	53,200,450.00
3	February-Mach 2013	11,120,000.00	64,320,450.00
4	April-May 2013	18,646,200.00	82,966,650.00
5	June-July 2013	25,400,300.10	108,366,950.00
6	August-September 2013	4,200,000.20	112,566,950.30
7	October-November 2013	6,100,400.00	118,667,350.30
8	December 2013-January 2014	3,500,300.60	122,167,650.90
9	February-March 2014	2,590,600.50	124,758,251.40

Source: (Field Survey, 2014).

On the other hand, Table 2 presents the cash outflows for the first extension project. The cumulative record of expenditure indicates a total expenditure of about 99%. The remaining balance of about 15 is therefore far less that the statutory 5% retention sum. Thus it can be concluded that the contractor's profit margin would at best be 1%, that is, if no expenditure was incurred during the retention period.

Table 3 depicts the cash inflow of the second extension project. Similar to the first extension project, about 15% of the contract sum was paid to the contractor in November 2012 as advance (mobilization fees). Also, five subsequent payments were made based on valuation and as at the end of the 6th valuation, 95% was paid to the contractor indicating that the remaining 5% was also retained as retention.

Table 3: Cash Inflow for the Second Extension Project at FCE, Zaria

S/No	Date	Valuation No	Amount in Valuation (₦)	Cumulative Cash Inflow (₦)
1	November 2012	Advance	18,452,223.90	18,452,223.90
2	January 2013	1st Valuation	25,480,860.26	43,933,084.16
3	May 2013	2nd Valuation	11,282,828.66	55,215,912.82
4	July 2013	3rd Valuation	33,555,035.15	88,770,947.97
5	January 2014	4th Valuation	21,649,497.04	110,420,445.00
6	March 2014	5th Valuation	6,736,532.49	117,156,977.50

Source: (Field Survey, 2014).

Table 4: Cash Outflow for the Second Extension Project at FCE, Zaria

S/No	Date	Amount (₦)	Cumulative Cash Outflow (₦)
1	October-November 2012	15,500,450.00	15,500,450.00
2	December 2012-January 2013	39,400,000.00	54,900,450.00
3	February-Mach 2013	10,645,050.00	65,545,501.40
4	April-May 2013	15,949,100.00	81,494,601.40
5	June-July 2013	20,500,600.00	101,995,201.90
6	August-September 2013	5,000,000.00	106,995,201.90
7	October-November 2013	4,200,400.00	111,195,601.00
8	December 2013-January 2014	5,909,612.05	117,105,214.95
9	February-March 2014	5,909,612.05	123,014,826.00

Source: (Field Survey, 2014)

Table 4 shows the contractor recorded a total expenditure amounting to 99.97%; indicating that he operated at loss, especially if retention attracts additional works. The third project had its cash inflow details, up to February 2014 presented in Table 5. Just like the previous projects, 15% was advanced to the contractor. As at the end of February, about 61% of the total contract sum was paid to the contractor.

Table 5: Cash Inflow for the Third Project at ABU, Zaria

S/No	Date	Payment No	Amount in Valuation (₦)	Cumulative Cash Inflow (₦)
1	June 2013	Payment 1	31,692,774.26	31,692,774.26
2	August 2013	Payment 2	40,628,679.22	72,321,453.48
3	November 2013	Payment 3	35,665,793.30	107,987,246.80
4	February 2014	Payment 4	20,032,661.08	128,019,907.90

Source: (Field Survey, 2014)

Table 6: Cash Outflow for the Third Project at ABU, Zaria

S/No	Date	Amount (₦)	Cumulative Cash Outflow (₦)
1	January 2013	1,465,098.00	1,465,098.00
2	February 2013	2,188,460.76	3,653,558.76
3	Mach 2013	22,548,616.44	26,202,175.20
4	April 2013	8,363,144.40	34,565,319.60
5	May 2013	20,411,088.00	54,976,407.60
6	June 2013	7,387,093.44	62,363,501.04
7	July 2013	8,388,000.00	70,751.501.04
8	August 2013	15,663,719.76	86,415,220.80
9	September 2013	3,662,280.24	90,077,501.04
10	October 2013	13,512,023.76	103,589,524.80
11	November 2013	25,749,278.40	129,338,803.20
12	December 2013	5,456,913.60	134,795,718.80
13	January 2014	3,341,575.51	138,137,292.30

Source: (Field Survey, 2014)

Data available regarding third project's cash outflow was up to January 2014 as shown in Table 6. Due to the fact that as at the time of data collection for this study the project was still on-going, it was not possible to draw any conclusion regarding the final payment, expenditure or profit margin of the contractor. However, it can be deduced that as at the end of January 2014 about 65.4% of the total contact sum had already been spent. Whereas compared to payment received by the contractor in February 2014, total expenditure recorded in January had already exceeded receipt in February by about 8%! The situation may not be healthy for the contractor.

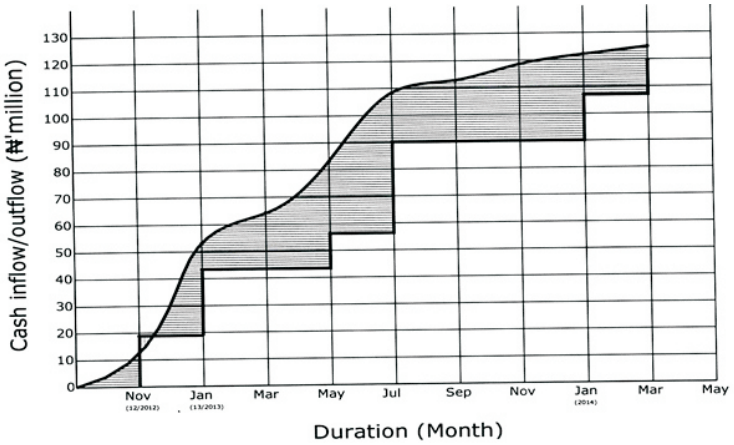

Figure 2. S-Curve for First Extension Project at FCE, Zaria

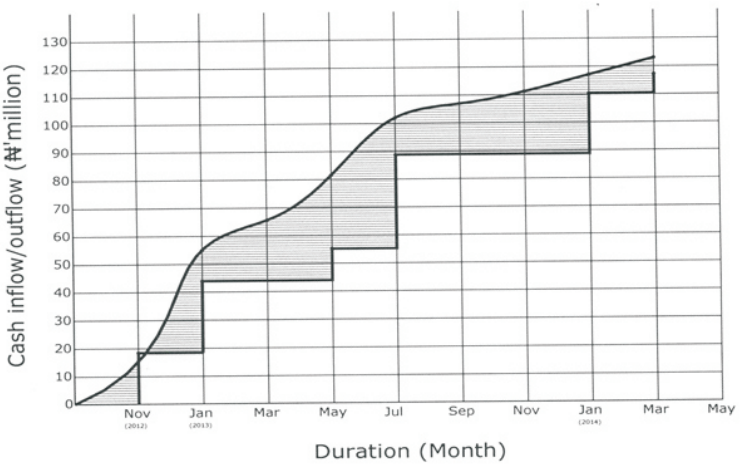

Figure 3. S-Curve for the Second Extension Project at FCE, Zaria

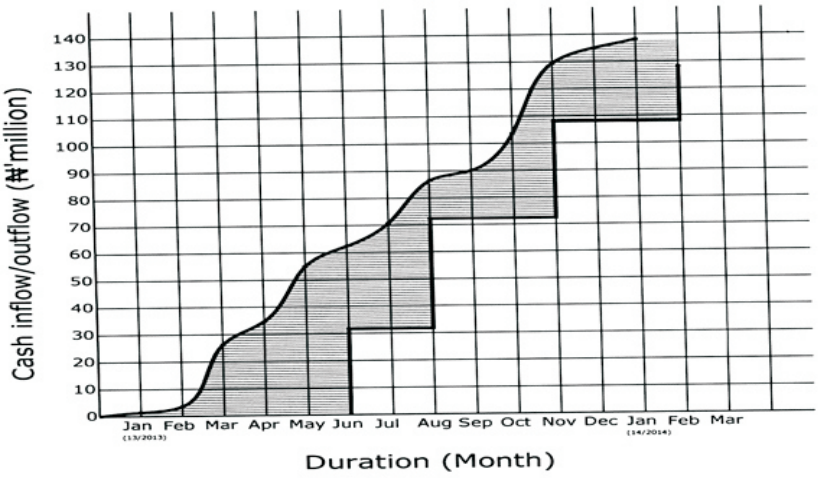

Figure 4. S-Curve for the Third Project at ABU, Zaria

Figures 2, 3 and 4 present the S-Curves of the three respective projects. Generally, regarding the characteristics of the S-Curves of the three projects, it can be depicted from figures 2 and 3 that both projects exhibited rapid initial start-up as indicated by sharp slope of the S-Curves (cash outflows) from beginning of November 2012 to middle of January 2013.

However, in figure 4 (for the third project) a contrary situation was observed where shallow slope depicted slow start-up for the project from beginning of January 2013 to first week of February 2013. It was revealed that setting out of the project was delayed due to unavailability of results of soil test on the site. The contractor had to wait until arrangements were made for the soil test to be carried out within the contract duration. Subsequently, all the projects recorded average, but definite progressions. This is indicated by the nature of slopes for the first and second projects up to July 2014 and that of the third project, from middle of March 2013 to November 2013. However, as from July 2014 the first and second projects became slow as indicated by shallow slopes up to the end of the projects in March 2014. Similarly, comparable assertion can be made as from November 2014 toward the expected date of completion about the third project.

The early rapid start-up in the first and second projects deviate from the typical nature of S-Curves for construction projects as reported by Halpin and Woodhead

(1980); Ciel 2011 and Nunnally (2011) that the general characteristic of construction projects' S-Curves results due to the fact that; early in most projects activities are mobilising and this makes expenditure relatively flat; that as many activities commenced, the expenditure increases which gives the curve a steeper middle; and that at the end, as activities are winding down expenditure flattens.

Thus it indicate that for the first two projects many activities were involved at the beginning as reflected by corresponding expenditures where about 50% of the cost were incurred between November 2012 and March 2013. Conversely, the expenditure pattern of the third project differed from the other two projects.

In contrast, about 50% of the expenditure was incurred within ten month into the project duration (January to October 2013). Another possible reason for the difference could be related to the nature of the projects. Whereas the first two projects were extension projects, the third project was entirely new. This depicts the assertion that "projects of the same type had similar shape of cumulative values versus time (S-Curve)" as reported by Harris and McCaffer (2001).

Generally, it can be depicted that the areas bounded by income and expenditure curves for all the projects were located under the expenditure curves (S-Curves). This indicates negative net cash flows for all the projects according to Halpin and Woodhead (1980); Gould (1997) and Bash *et al.,* (2015), notwithstanding the case of the first and second projects at the beginning of December 2017 where small areas were slightly above the S-Curves.

Thus the projects studied were generally executed under negative net cash flows. Bash *et al.* (2015) opined that "duration and distribution of negative cash flow are critical factors in construction performance" and that, "minimising negative flow ensures smooth financial pressures."

Conclusion and Recommendations

The characteristics of the S-Curves of two of the projects depicted rapid initial start-up indicating engagement of many activities at the beginning, while the third project depicted slow start-up due to unavailability of results of soil test. This made TETFUND projects to be peculiar contrary to what was established in the literature that most project exhibit slow beginning. Subsequently, all

the projects recorded average progressions and toward the end, progress of all the projects became slow (reflecting what the literature established). However, all the projects were largely executed under negative cash flows with one virtually at a loss. It is therefore recommended that S-Curve should be employed by contractors in financial planning and management in executing TETFUND projects in order to understand financial commitments and implications involved.

Finally, it should be noted that due to confidentiality in releasing financial data required by this research, only three case studies were covered by the research. This is noted as a major limitation of the study.

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