Development of Cash Flow Software Model for Manufacturing Industry

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Abstract
Manufacturing industries in Ondo state and environs are increasing gradually, but most of the existing ones found it difficult to report their financial status as at when due. These reports when a times made available are error prone and lacks details. These were caused by human errors in computation and drudgery experienced during prolong manual computation using table calculators. This research found it dim fit to produce a lasting solution to these problems. This research investigated the Cash Flow analysis of wire and cable Manufacturing Industry in order to know the attributes required for the computation of the cash flow. Some of these attributes identified and considered in this research are majorly classified as inflow and outflow cash. The inflow consist of balance before the new year brought forward, bank loan(s), cash sales and other sources while the cash outflow involves; rent(s) insurance, licenses/permits, loan payment, legal and account fees, capital expenditure, salary, wages, repairs and maintenance, automobiles, spare-parts, transportation, advertisement, general office supplies, dues/subscription, communication, inventory and raw materials, shipping and delivery, utilities electricity / generator, and miscellaneous. These attributes are used to develop a Cash Flow Software Model that is able to solve various cash flow problems. Denki Wire and Cable Nigeria Limited, Akure, Ondo State was used as a case study for this research and Questionnaires were administered as well as data collation forms. A Computer Aided Software Model was constructed with the aid of PYTHON programming language. The major models used are: Discounted Cash Flow Model, Present Value Model, Gordon’s Growth Model, Product Cost and Net Cash Flow models. The results obtained from the 12 months discounted cash flow projection shows that the company will experience a positive cash flow all through the year provided it is able to meet up with the loans collected from banks and other creditors, and ensuring high sales of products in order to make its cash inflow greater than cash outflow. It was concluded that the best way to represent a cash flow analysis for Manufacturing Industries is with the use of an electronic spread sheet medium. This will give room for easy analysis and processing of all the data obtained. In order to avoid negative cash flow, Manufacturing Industries should set aside part of the profit generated, for expansion and they should borrow money only when needed. This software model will be applicable to small, medium and large scale manufacturing industries for their cash flow computation and analysis.

Keywords: development cash flow, software model, manufacturing, industry, python programming, case study

INTRODUCTION
This research aims at solving various cash flow problems facing Manufacturing Industries. A manufacturing industry is defined as a building or a location where the production of goods and materials that are necessary for living is being carried out using raw materials. (Microsoft Encarta, 2009). A cash flow analysis is a document that shows the movement of cash (money) in and out of a business (Wikipedia, 2009). The cash flow statement is a tool that helps to provide information about the liquidity and loan payment capacity of a business. Through this, a manufacturing company will be able to know and predict if it has enough money to pay its present and future bills. (Victoria, 2008). The computer software (program) is a series of step by step logical instructions that is written down, using a computer language, with the aim of solving particular or specific problems (Adejuyigbe, 2002). The software used in this research will be able to record the timing and size of the cash inflows and outflows that occur over a given accounting period, usually one year. The accounting period is broken down into smaller periods, usually months and then the Total Cash Inflow, Total Cash Outflow, and Net Cash Flow is taken for each month.

The aim of this research is to develop cash flow computer software that is comprehensive and analytical enough to help manufacturing companies to improve their financial management skills and thereby sustaining the smooth operation of their company. This research identifies: the parameters required for cash flow analysis; the mathematical models required for cash flow analysis computation; develop the algorithm for the software development and test the developed software using a case study to know its level of performance and effectiveness.
Once Manufacturing Industries become familiar with this cash flow analysis model, they will find out that it is a necessary reference and planning tool. This calls for the reason to design and develop a Computer Aided Model that can accomplish these objectives. This Software Model will be able to provide valuable management information for Manufacturing Industries in form of an electronic spreadsheet format.

Research has shown that odd as it may seem, most manufacturing industries (both large and small scale) are making a profit when they go out of business. This is because they ran out cash to pay some of their crucial bills such as rent, equipment, fuel and electricity, etc (which are collectively called factory overheads), and so they will fold up (Victoria, 2008).

The uniqueness of this research is that it combined the model of the above authors, and it also considered the development of the product cost model. This enabled Manufacturing Industry to be able to determine the cost of producing a unit of its product.

**METHODOLOGY**

The methods used in this research are identification of cash flow attributes, mathematical model required, development of the flow chart (logic) and software required using Python programming language.

The mathematical models identified and used in this research are:

(a) Discounted Cash Flow Model (DCF)

\[
NPF = CF_0 + \frac{CF_1}{1+d} + \frac{CF_2}{(1+d)^2} + \ldots + \frac{CF_n}{(1+d)^n} 
\]

Where: CF = the cash flow of each period within the investment analysis horizon, d = the discount rate and n = last period of the investment horizon.

(b) Present Value Model

\[
PV = FV_n/(1+r)^n 
\]

Where; PV = Present Value, FVn = future value for n years, r = interest rate per annum and n = number of years for which compounding is done.

(c) Net Present Value (Model)

\[
NPV = \sum_{t=0}^{n} C_t/(1+r)^t - C_0 
\]

Therefore, this cash flow analysis model will help manufacturing companies to overcome the complexity and time consuming factors of manually estimating their monthly/yearly turnover in form of profit and loss.

In addition to this, the cash flow model developed in this research is able to display the product cost sheet which will contain the total cost of raw materials, cost of labour and packaging materials. This will help to estimate and determine the unit cost of a product to be sold.

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The table below shows the various authors who had done major researches on Cash Flow analysis:

<table>
<thead>
<tr>
<th>S/N</th>
<th>Author</th>
<th>Year</th>
<th>Contribution</th>
<th>Cited by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fisher</td>
<td>1930</td>
<td>Theory of interest</td>
<td>Thavamani T.A, 2007</td>
</tr>
</tbody>
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Table 2.1; Summary of Models used and Authors

<table>
<thead>
<tr>
<th>S/N</th>
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<tbody>
<tr>
<td>1</td>
<td>DCF Model</td>
<td>Irving Fisher</td>
<td>1930</td>
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</tr>
<tr>
<td>2</td>
<td>Present Value Model</td>
<td>John Borr Williams</td>
<td>1938</td>
<td>McKinsey et al, 2005</td>
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<tr>
<td>5</td>
<td>Product Cost Model</td>
<td>Denki</td>
<td>2011</td>
<td>Denki sheet, 2011</td>
</tr>
<tr>
<td>6</td>
<td>IRR Model</td>
<td>Hazen G.B</td>
<td>2003</td>
<td>Baker and Summery, 2000</td>
</tr>
</tbody>
</table>

DEVELOPMENT OF SOFTWARE MODEL

After the logic development which results from the integration of the mathematical models aforementioned, the software was developed.

The software in this research was developed by using a PYTHON programming language. This programming language was used because of its simplicity in coding the interface and its analytical properties. The developed software is able to: display the factory product cost sheet, and estimate the unit cost of manufacturing a product by using the Product Cost Model; display a 12 month projected Cash Flow statement in form of an electronic spread sheet, whereby the variables can be edited and re-edited to give the desired results; calculate the Net Cash Flow, Gross Profit and Net profit/loss per month; project the present value of a future amount by using the NPV model, and estimate the cash balance at the end of each month.

Assumptions Made In Developing the Software Model

- The Cash Flow Model is based on projected future cash flow analysis which is based on historical data.
- The discount rate employed by the model depends on a risk free interest rate and cost of capital.
- In calculating for NCF, the annual income of the factory is assumed to be of almost equal value.
- The projected cash flow that is used in the software model is assumed to be free cash flow.

SOFTWARE MODEL APPLICATION

Denki Wire and Cable Manufacturing Industry, Akure, Ondo State Nigeria was chosen as a case study for the Cash Flow Model developed in this research. The company is a medium scale manufacturing Industry with the production capacity of about 1000kg (wire and cable) per day. The software model can be applied to solve various cash flow problem of the factory.

Other Areas of Application of the Model

The Cash Flow Model developed in this research can be used in the following areas:

1. In Manufacturing Industries: to plan for what quantity and quality of products and services to produce for the incoming fiscal year in other not to run at loss.
2. In Institutional, investment property, and general factory business valuation.
3. In Production Company: to monitor the actual cash flow of the company, identify potential problems and then plan for future projects.
4. As a tool for technical feasibility study in manufacturing Industries and other production companies.
Fig 2.1 shows the Cash Flow Software home page. This is the welcome page that is first displayed once the software is launched. It displayed the following information:
- Raw material/product cost
- Cash inflow
- Cash outflow
- Net cash flow
- Cash flow sheet
- Cash flow models

**RESULTS**
The cash flow analysis software model developed in this project is able to display the results obtained in the form of an electronic spreadsheet that will include: columns for the number of months to be considered (for example; January to December). Other variables that will be displayed are:
- Inflow (sales, jobs, contracts, benefits, etc)
- Total inflow
- Fixed expenses (Rent, Insurance, Loan Repayment, Capital Expenditure, Permits)
- Total fixed expenses
- Variable expenses (salaries, fees, supplies, food, equipments repair, staff welfare, etc.)
- Total variable expenses
- Net total expenses/outflow
- Net cash flow
- Gross Profit

**Software Models Applied**

![Fig 3.1a: Product cost sheet](image1)

![Fig 3.1b: Product cost per unit](image2)
Fig 3.2; Cash flow sheet

Fig 3.2 shows the interface for the 12 months (January to December fiscal year) cash flow projection as obtainable from the case study (Denki Wire and Cable Company). The results were derived by combining the cash inflow and the cash outflow variables in the software together. The Net Cash flow (which is equivalent to the Gross profit) is calculated as total cash inflow minus total cash outflow.

DISCUSSION

Cash Inflow

The Cash inflow consists of the sum total of all the income entering the company’s account. This includes all the sources of cash such as: Balance brought forward, Loans, Sales, etc. In this software model, the entry for the bank loan will only be used or entered for the first month of the projection.

Cash Outflow

These are the means by which cash leaves the company’s account. It includes the various types of expenses made within a period of time. The cash outflow is divided into two fields: Fixed expenses and the variable expenses. The fixed expenses describe those assets whose values do not easily change with time such as: Insurance, License/Permits, Loan repayment, Rent, etc. The variable expenses are those expenses that do not have a fixed value over time. They include: Salaries/wages of workers, Maintenance and Repair, automobiles, Transportation, advertisement, office supply, utilities, electricity supply, and other miscellaneous spending.

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

This research had been able to identify the parameters and produce the algorithm required for the development of a cash flow analysis software model. The software model developed in this research gives room for the operator to be able to enter and re-edit necessary variables of the cash flow sheet and to have their result calculated immediately. It also helps to minimize listing of similar expenditures over and over again in the spreadsheet. The Model is an effective cash flow analysis tool, which is able to perform several other functions related to cash flow as far as Manufacturing Industry operation is concerned.

It can be concluded that the results obtained from the 12 months discounted cash flow projection shows that the company will experience a positive cash flow all through the year provided it is able to meet up with the loans collected from banks and other creditors, and ensure high sales of products in order to make its cash inflow greater than cash outflow. It can also be concluded that the best way to represent a cash flow analysis for Manufacturing Industries is with the use of an electronic spreadsheet medium. This will give room for easy analysis and processing of all the data obtained.
RECOMMENDATIONS
In order for a Manufacturing Industries not to experience a Cash Flow crunch (negative cash flow or loss), the following recommendations are made:
1. They should avoid employing unnecessary staffs and workers.
2. They should burrow money only when needed in order to avoid unnecessary debts.
3. They should not expand too rapidly because the increase in sales might not be enough to cover up for increased inventory, overheads and labour cost.
4. They should keep a tight inventory control that is well monitored so as not to spend unnecessary cash on inventory control.
5. Extending credits to customers must be under a close supervision and solid agreement.

This developed software model is purely for analysing the flow (inflow and outflow) of cash in manufacturing industry. It cannot be used as capital scheduling model or forecasting model. It gives situation report of cash flow.

ACKNOWLEDGEMENT
I have to appreciate Awoyo, M. O. for his time committed to this research in area of data collection and processing.

REFERENCES


Denki Wire and Cable Nigeria Limited (2011); Cash Flow Projection Sheet from October 2010 to September 2011; Km 1, Akure - Ife Express Way, Akure, Ondo State.

