

# **SET THEORETIC APPROACH TO FUNDS FLOW STATEMENTS – A STUDY WITH REFERENCE TO STATE BANK OF INDIA**

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**Abstract:** Two most popular as well as basic financial statements are INCOME STATEMENTS and BALANCE SHEET. These two statements serve a very important purpose. Nevertheless, these two statements fail to enlighten us about the other important financial aspects of a business entity. They do not give us any information regarding the financing of business operations. i.e. the manner in which the funds have been generated by the enterprise and the pattern of their utilization in such operations. This missing link in these financial statements is provided by the preparation of a additional statement called 'Statement Of Changes In Financial Position'. The statement is also known as 'Fund Flow Statement' or 'Statement of Sources and Applications of Fund'. The objective of the present study is to Analyse the Funds Flow Statements in a new approach and to make the analysis and interpretation of the Funds Flow and Cash Flow Statements more interesting and attractive to the non-commerce background people. It used secondary data from the Annual Reports of the State Bank of India for the two subsequent financial periods 2010-11 and 2011-12. Tool used for the study was Set Theory.

**Keywords:** Set Theory, Financial Statements, Funds Flow Statements, Balance Sheet.

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## **Introduction:**

**1.0. Backdrop:** Two most popular as well as basic financial statements are INCOME STATEMENTS and BALANCE SHEET. These two statements serve a very important purpose. They enlighten us about the economic goals of a business entity through the figure of net income and the presentation of the financial position of the enterprise as represented by its assets and liabilities. Nevertheless, these two statements fail to enlighten us about the other important financial aspects of a business entity. They do not give us any information regarding the financing of business operations. i.e. the manner in which the funds have been generated by the enterprise and the pattern of their utilization in such operations. This missing link in these financial statements is provided by the preparation of a additional statement called 'Statement Of Changes In Financial Position'. The statement is also known as 'Fund Flow Statement' or 'Statement of Sources and Applications of Fund'. A statement of sources and application of funds, is a technical advice designed to highlight the changes in financial position of business enterprise between two dates.

Funds Flow Statement is a statement showing flow or movement of funds during a given accounting period. It is basically an inflow-outflow of funds statement. This statement has two parts:

- 1. Resources provided(sources of funds) and**
- 2. Resources applied (uses of funds).**

The difference between the totals of the two sections indicates the net change in funds during the period.

The present study demonstrates how funds-flow analysis can be formulated in terms of set theory. The approach presented here provides an introduction to some basic set-theory concepts in the context of a familiar accounting problem; accordingly, definitions and explanations of these concepts are included. *The Statement of Sources and Uses of Working Capital* Regardless of the definition of "funds" adopted, the usual first step in preparing a funds statement is the computation of the net change in funds.

This requires a separation of balance sheet accounts into fund (which enter directly into the computation of funds) and non-fund accounts (which do not). For convenience, "funds" are defined as "working capital" unless otherwise stated. Thus, current assets and current liabilities are the fund accounts and all other non-current accounts are the non-fund accounts which we refer to as non-current.

We cover but a few of the basic concepts because of space limitations. No use, for instance, is made of the set ordering brackets in this article. But were it necessary to refer to a set of current assets and were it desired to list accounts in the order of liquidity, we could stipulate this by introducing angular brackets:

**Current assets = (Cash, Marketable Securities, Accounts Receivable, . . . , Prepaid Expenses).**

**1.1. Brief Review of the Available Literature:** While finding the pin-pointed research gap and appropriate research questions on the aforesaid topic, we had to jump into a glimpse of available literature, presented underneath:

Most introductory textbooks on mathematics now include a discussion of set theory concepts. For the interested reader, the following introductory material is noted:

Samuel Goldberg, *Probability: An Introduction* (Englewood Cliffs: Prentice-Hall, 1960), Chap. 1, pp. 1-44;  
W. Allen Spivey, "Basic Mathematical Concepts," in *Linear Programming and the Theory of the Firm*, K. E. Boulding and W. A. Spivey, eds. (New York: Macmillan, 1960), pp. 1S-24; F. Mosteller.

R. E. K. Rourke, and G. B. Thomas, *Probability with Statistical Applications* (Reading, Mass.: Addison-Wesley, 1961). pp. 403-16.

More advanced treatment may be found in Mathematical Association of America, Committee on the Undergraduate Program,

*Elementary Mathematics of Sets with Applications* (New Orleans: Tulane University, 1958); Patrick Suppes, *Axiomatic Set Theory* (Princeton, N. J.: Van Nostrand, 1960).

For a discussion of the mathematical logic underlying funds-flow analyses without the use of set theory concepts, see Ching-wen Kwang and Albert Slavin, "The Mathematical Unity of Funds-Flow Analyses," *NAA Bulletin*, Jan. 1965, pp. 49-56.

**1.2. Finding the Ultimate Research Vacuum:** After a minute study of the above available literatures, we found that no such study has yet been made in the analysis of financial statements of the corporates, especially, belonging to those in the Banking Sector.

**1.3. Objectives of the Present Study:** In view of the above available literatures, we find the following objectives pertinent to our study :

1. **To Analyse the Funds Flow Statements in a new approach**
2. **To make the analysis and interpretation of the Funds Flow and Cash Flow Statements more interesting and attractive to the non-commerce background people.**
3. **To use more mathematics for managerial decision making, depending on the financial statements.**
4. **To throw some light on the new approaches used by financial analysts.**

**1.4. Methodology of the Present Study**

For the present research work, we used simple set theoretical approach in explaining the Funds Flow and Cash Flow Statements of State Bank of India, our selected company, for the study.

**1.4.1. Period of Study:** We used the financial statements, i.e., Profit & Loss Account and Balance Sheet of SBI for the current two financial years, i.e. 2016-17 and 2015-16 (as available from the website [www.moneycontrol.com](http://www.moneycontrol.com)), in order to prepare the funds flow and cash flow statements of the same, for the current year.

**1.4.2. Nature of Data:** We used secondary data, i.e., the financial statements like Profit & Loss Account and Balance Sheet of SBI for the current two financial years, i.e. 2011-12 and 2010-11 (as available from the website [www.moneycontrol.com](http://www.moneycontrol.com)),

**1.4.3. Tools for Analysis:** We used simple mathematical tool like set theory, to analyse and interpret the funds flow statements of the selected company under study and also venn diagram to interpret the results. We also used simple mathematical equations for the said purpose.

**2.3. Funds Flow Statement:** A Funds Flow Statement is a summarized statement of the movement of Funds (i.e., Working Capital) from different activities of a concern during an accounting period. It is prepared to locate the various sources of fund inflows into the business and also to identify the various purposes of fund outflows from the business, during two consecutive Accounting Periods. As it is a summarized statement of Fund inflows and fund outflows from different activities of an enterprise during a particular period, the management gets a vivid picture of the movement of Fund in between two consecutive Balance Sheet dates by preparation of a Fund Flow Statement. One side of the Fund Flow Statement shows the various sources of Fund and the other side shows the various applications of Fund during an accounting period. A Fund Flow Statement acts as an important tool of Financial Analysis to the management. Thus, the management can access the movement of Fund from different activities of the business and can draw up its future planning.

**2.4. Importance of Fund Flow Statement:** Fund Flow Statement acts as an important tool for Financial Analysis and shows the brief reasons for change in the Working Capital between two Balance Sheet dates. It has more importance from the viewpoint of the management of a concern. It serves the following purposes:

1. Fund flow statement explains how the financial position has changed from the beginning of an accounting period to the end of that period.
2. It acts as an important instrument for allocation of resources of a concern. It enables the concern for making plans for optimum allocation of resources.
3. It answers many intricate financial queries such as reasons for changes in Working Capital position, various non-operating activities, fund generation through operating activities and so on.
4. It helps the management in the process of effective use of the Working Capital of a concern.
5. As projected Fund Flow Statement estimates the future fund position of a concern, it helps in framing the rational dividend policy of the concern without any adverse impact on the operating working capital.
6. it helps the management in planning the future financial requirements.
7. it projects the future fund generation, aids in future investment planning and also helps in the working capital management of a concern.

**2.5. Preparation and Interpretation of Fund Flow Statement:** Preparation of fund flow statement involves dealing with the different transactions, which can affect the flow of funds or the application of funds or which may not affect at all. While preparing fund flow statement we should take into consideration the following factors:

- **Transactions that affect current and fixed assets.** A transaction, which changes the balance of current assets and fixed asset, will make a flow of funds.
- **Transactions that affect current assets and non-current liabilities.** When a transaction effects a change in current asset and non-current liability, it will result in flow of funds.
- **Transactions that affect current liability and non-current assets.** All those transactions, which involve current liabilities and non-current assets, will result in flow of funds.

- **Transactions that affect current liability and non-current liability:** when there will be change in current liability and non-current liability will result in flow of funds.

It may be mentioned here that the following transactions will not affect funds.

- **If Transaction Affect Accounts of Current Category Only:** All those transaction which effect the current assets or current liabilities only will never result into flow of funds.
- **If Transaction Affect Non-Current Accounts Only:** There will be no change in flow of funds, if a transaction affects accounts of non-current category only.

Flow of Funds means movement of working capital over a period of time. In other words, increase or decrease in working capital reflects flow of funds. When a transaction increases working capital, it is known as a 'Source' of Funds and when it decreases the working capital, it is termed as 'Use' of funds. When a business transaction does not affect working capital, no flow of funds takes place. Let us see how business transactions affect working capital with the help of following Balance Sheet of X Ltd. :

**Balance Sheet of X Ltd. As on .....**

<i>Liabilities</i>	<i>Amount Rs.</i>	<i>Assets</i>	<i>Amount Rs.</i>
Share Capital	10,00,000	Fixed Assets	12,00,000
Term Loans	5,00,000	Investments	2,00,000
Profit & Loss A/c	1,00,000	Current Assets	6,00,000
Current Liabilities	4,00,000		
	20,00,000		20,00,000

The following transactions took place after the preparation of the above Balance Sheet:

1. Alpha Ltd. Issued shares for cash Rs.5,00,000/-
2. The Company purchased Fixed Assets for Rs.3,00,000/-
3. Alpha Ltd. Sold investment for Rs.50,000/-
4. Profit earned Rs.50,000/- from the business operations.

Let us analyse whether the above business transactions affect the working capital or not.

- a) Due to issue of Shares of Rs.5,00,000/- for cash, Share Capital has increased from Rs.10,00,000/- to Rs.15,00,000/- and Bank balance has also increased by Rs.5,00,000/-. Share Capital is a non-current liability and bank is a current asset. Therefore, increase in bank balance has also increased the working capital. Hence, it is a Source of Funds.
- b) Purchase of Fixed Asset for cash is a use of Funds. Cash has decreased and fixed asset has increased. Decrease in current asset has decreased the working capital, thus it is a Use of funds.
- c) In the transaction of sale of investment, investment is a non-current asset and cash is a current asset. Current asset is increasing, thus, it is a source of funds.
- d) Cash payment of Rs.1,00,000/- to Creditors has decreased both current asset (i.e., cash) and current liabilities, i.e., (creditors). As a result, working capital has remained intact since both current asset and current liabilities have decreased by the same amount. Therefore, this transaction does not cause any flow of funds.
- e) Profits earned from business operations is a source of funds.

Now, with the help of Sources and Uses (Applications) of funds, a statement can be prepared as under:

<i>Sources</i>	<i>Amount Rs.</i>	<i>Uses (Applications)</i>	<i>Amount Rs.</i>
Issue of Share Capital	5,00,000	Purchase of Fixed Assets	3,00,000
Sale of Investment	50,000		
Profits from Operations	50,000		

In the above statement, all those transactions which increase or decrease the working capital have been included and those which do not affect working capital have been excluded. Such a statement is termed as “funds Flow Statement”. This statement is also known as “Statement of Changes in Financial Position (SCFP)”.

**The Standard Format of Funds Flow Statement is as Shown Below**

<i>Sources of funds</i>	<i>Amount Rs.</i>	<i>Application of funds</i>	<i>Amount Rs.</i>
Issue of shares	Xxxxx	Redemption of redeemable preference shares	xxxxx
Issue of debentures	xxxxx	Redemption of debentures	Xxxxx
Long-term borrowings	Xxxxx	Payment of long-term loans	Xxxxx
Sale of fixed assets	Xxxxx	Purchase of fixed assets	Xxxxx
Operating profit*	Xxxxx	Operating loss*	Xxxxx
Decrease in working capital*	Xxxxx	Increase in working capital*	Xxxxx
	xxxxx		xxxxx

\* Only one figure will be there.

**2.6. Different Sources of Funds:** Sources of fund may be classified into two broad categories : Fund from the operating activities and fund from the non-operating activities. Sources of Fund from the operating activities refer to the Fund that is coming into the business due to the operating activities of the concern. Examples of sources of Fund from such operating activities are : Cash Sale of Goods, Credit Sale of Goods, discount received, commission received and so on.

On the other hand, the sources of fund from the non-operating activities refer to the Fund that is coming into the business due to the various activities of the concern other than the operating activities. Examples of sources of Fund from such operating activities are : Sale of Fixed Assets and long-term investments, proceeds received from the issue of equity, preference shares and debentures, proceeds received from long-term borrowings and so on.

**2.7. Different Applications of Fund:** Applications or uses of fund may also be classified into two broad categories – Fund for the operating activities and fund for non-operating activities. Applications of Fund for operating activities refer to the Fund that is going out of the business due to the operating activities of the concern. Examples of applications of Fund for such operating activities are : Cash Purchase of Goods, Credit Purchase of Goods, Payment of Wages and Salaries, outstanding wages and salaries, and so on.

On the other hand, applications of Fund for non-operating activities refer to the Fund that is going out of the business due to various activities of the concern other than the operating activities. Examples of applications of Fund for such operating activities are : purchase of Fixed Assets and long-term investments, redemption of preference shares and debentures, repayment of long-term borrowings, payment of dividend, tax and so on.

**2.8. Funds from Operations:** Fund from operation or Net Fund Flow from Operating refers to the difference between the inflows of Fund and the outflows of Fund from the operating activities of the concern. It is the net Flow of Funds from the operating activities of the concern. Net Flow of fund refers to the excess of Fund inflow over the Fund outflow or vice versa. For ascertaining the Fund from Operation, two important points are to be simultaneously considered. They are:

- (a) There are inflows or outflows of Fund (i.e., Current Assets or Current Liabilities).
- (b) These inflows or outflows of Fund occur due to the operational activities of the concern. Suppose, the raising of long-term loan reflects the inflow of Fund, still, such inflow of fund has not occurred due to the operational activities of the concern. Sale of Goods, Purchase of Goods, Wages, Salaries and so on, are the causes of movement of Fund due to the operational activities of the concern. Hence, the Fund

from Operation exhibits the Net Flow of Funds coming into or going out of the business due to its operating activities.

**2.9. Different Approaches of Computation of Fund from Operation:** The fund from operation (i.e., Net fund Flow from operational activities) may be computed under two different approaches, such as Direct Approach and Indirect Approach. Depending upon the information given, a particular approach for computation of Fund from Operation is followed. These two different approaches of computation of Fund from Operation are presented underneath one by one:

**2.9.1. Direct Approach of Computation of Fund from Operation:** When the Fund from Operation is computed directly by deducting the operating fund outflows from the operating fund inflows, such as approach is called 'direct approach'. Where the details of the operating incomes and expenses are given and the net Fund Flow from the Operation is computed by following the Direct Approach. Under this approach, the difference between the Fund inflows and Fund outflows from operation represents the Net Fund Flow from Operation.

The proforma of computation of Fund from Operation under Direct Approach is shown as follows :  
Statement showing Computation of Fund From Operation for the period .....

Particulars	Rs.	Rs.
<b>Inflows of Fund from Operating Activities :</b>		
Cash Sales	-	
Credit Sales	-	
Other Operating Fund Inflows	-	
	<hr/>	
<b>Less : Outflows of Fund from Operating Activities :</b>		-
Cash Purchases	-	
Credit Purchases	-	
Total Wages	-	
Total Salaries	-	
Total General Expenses	-	
Other Operating Fund Outflows	-	
	<hr/>	-
<b>Net Fund from Operation</b>		<hr/>

**2.9.2. Indirect Approach of Computation of Fund from Operation:** When Fund from the operation is computed by adding back all the non-operating and non-fund items considered in the Profit & Loss Account to the net profit for the year, such approach is called indirect approach of computation of Fund From Operation.

Where the Net Profit along with all the Non-Operating and Non-Fund items considered in the Profit & Loss A/c are given, the Net Fund Flow from the operating is computed by the following Indirect Approach. Where the Balance Sheets of two consecutive years along with the additional information are given, the Net Fund Flow from the Operation is also computed by following the Indirect approach.

**3.1. Introduction to Set Theory:** A set is a well defined collection of distinct objects. Since accounts are defined in accounting, and since each is distinct from the others, the totality of all balance sheet accounts constitutes a **set**. When a set consists of all objects under discussion in a given context it is called the universe of discourse or the universal set, which we denote by the symbol *U*. The set of balance sheet accounts is one such universal set. The individual objects which collectively comprise a given set are called its members or elements. The membership relation is denoted by the inclusion symbol  $\in$ . For example, the cash account is an element of *U*, and we write "cash account  $\in U$ ." An exclusion symbol  $\notin$  is used to indicate that an object does not belong to a given set. In general, capital

letters are used to designate sets while lower case letters are used to indicate elements of sets. A set can be specified by listing its members.

**3.2. Set Inclusion – Conceptual Aspects:** Set inclusion refers to the relationship that one set is a subset of another set.

Suppose  $A \subseteq B$  and  $B \subseteq C$ , then it follows that  $A \subseteq C$ . We say that set inclusion is a transitive relation. In set notation the transitivity relation may be written;

$$\{R, B\} \subseteq RE \ \& \ RE \subseteq NC \longrightarrow \{R, E\} \subseteq NC.$$

The set of the sets of revenues and expenses being a subset of retained earnings and retained earnings being a subset of the non-current set implies that the set of the sets of revenues and expenses is a subset of the non-current set. Henceforth, to avoid the cumbersome statement, "is a subset of the non-current set," the more compact expression, "non-current subset," or simply a non-current set, will be used.

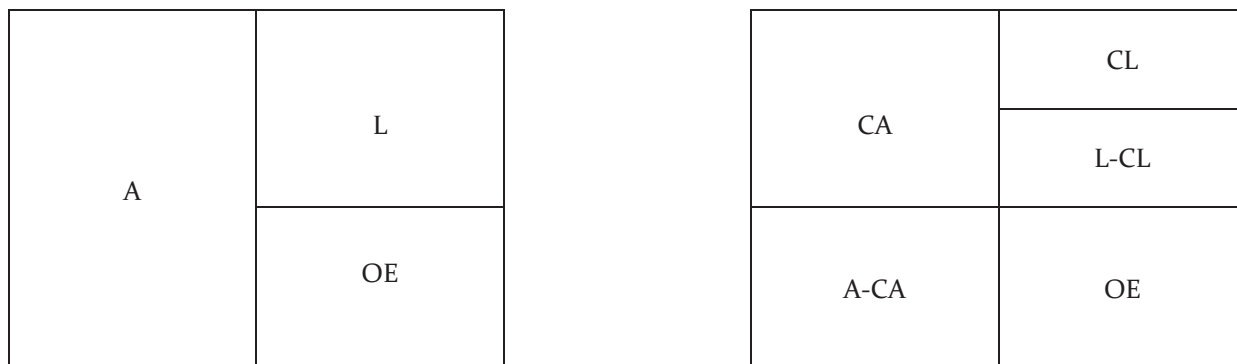
**3.3. Application of Set Theory in Financial Statement Analysis**

For our present work, in universal set  $U$ , we write

$$U = \{\text{Cash, Accounts Receivable, . . . , Plant and Equipment, . . . , Bonds Payable, . . . , Capital Stock, Retained Earnings}\}.$$

This notation is read "the set  $U$  is the set whose members are the accounts Cash, . . . , Capital Stock, Retained Earnings." Alternately, a set may be defined by specifying some property (or properties) that tells us which things are members and which are not. "The universal set" can be shown (by introduction of a paradox attributed to Bertrand Russell) to be non-existent. The correct expression would be "universe of discourse"; however, "universal set" is a more compact term and will be used in this paper as a synonym for "universe of discourse."

For logical reasons, the universal set  $U$  is a subset of itself; the empty set  $\emptyset$  which contains no elements is considered a subset of every set.



Thus we might wish to describe an asset as follows:

$$X \in A \iff p, f(x).$$

Something,  $X$ , is an asset (strictly translated—is a member of the set of assets,  $A$ ) if and only if it is possessed,  $p$ , by a business and is expected to yield beneficial services in the future,  $f$ .

From the elements of the universal set 'U', we can form new sets which are called subsets of 'U'. For any two sets  $A$  and  $B$ , the set  $A$  is said to be a subset of  $B$  if, and only if, every element of  $A$  is also an element of  $B$ . This is indicated by  $A \subseteq B$ . The three major categories of balance sheet accounts, assets, liabilities, and owners' equity are subsets of the set of all balance sheet accounts. This relationship is shown (by means of a Venn diagram) in Figure 1 and 2 as above. The large rectangle represents  $U$ ; the areas labeled  $A$ ,  $L$ , and  $OE$  represent the three major classifications. For purposes of analyzing changes in working capital, the balance sheet accounts must be further subdivided. Figure 2 shows these relationships in

terms of the subsets pertinent to the preparation of the statement of sources and uses of working capital, where –

**A = assets;**  
**CA = current assets;**  
**A – CA = non-current assets;**  
**L = liabilities;**  
**CL = current liabilities;**  
**L – CL = non-current liabilities;**  
**OE = owners' equity.**

This graphical method of representing sets is named after the English logician John Venn and hence called Venn diagrams. The type we used here is a special kind attributed to Lewis Carroll (Charles Dodgson). For further discussions, see Kenneth O. May, *Elements of Modern Mathematics* (Reading, Mass.: Addison-Wesley, 1959), pp. 152-156.

More technically, a partition of a set  $S$  is a set of subsets of  $S$  which are (1) disjoint, i.e., no two subsets have any elements in common; and (2) exhaustive, i.e., the elements in all the subsets taken together constitute the original set  $S$ .

**3.4. Set Theoretical Definitions of Current Accounts and Non-current Accounts:** We refer to the current accounts as the current set and the non-current accounts as the non-current set. The subdivision of a set into subsets in such a way that every element belongs to one, and only one, of the subsets is called a partition of the set. In other words, every member of the original set must be contained in one of the subsets and no member must belong to more than one subset. It is sometimes convenient to be able to refer to a single account as "a current set" instead of "a member of the current set" or "a subset of the current set." To insure against ambiguity in these terms, we designate the universal set as:

**Current Set:**  $U = \{\text{Cash, Accounts Receivable, ....., Prepaid Expenses, Accounts Payable, ....., Current Maturities of Long Term Debt}\}$

**Non-Current Set:**  $U = \{\text{Property, Plant \& Equipment (net), ....., Cash Surrender Value of Life Insurance, Bonds Payable, ....., Retained Earnings}\}$

Each element (e.g.. Cash) of a subset (e.g.. Current Set) of the universal set can be viewed as a set in itself. When thus conceived, each, account is a set and has its own elements, we may use the expression "**cash is a current set**" as well as "**cash is a subset of the current set**" because:

1. The former expression is less cumbersome, as well as less precise.
2. The characteristic which determines membership in the current set is the condition of being considered current; therefore, it is perfectly proper to refer to a set by mentioning its identifying characteristic - in this instance, the adjective "current."

Before proceeding further, we define additional symbols as follows:

**CC = contributed capital;**  
**DIV = dividends paid;**  
**R = revenues;**  
**E = expenses;**  
 **$\Delta$  = the set of changes in account balances between the two balance sheet dates obtained by subtracting the beginning account balances from the ending balances. Where the distinction between a debit change and a credit change is to be made, the notation  $\Delta_d$  (debit change) and  $\Delta_c$  (credit change) will be used;**  
**NC = the set of non current accounts;**  
**S = the set of sources of funds;**



**U = the set of uses of funds;**  
**T = the set containing transfers between non-current accounts, defined as transactions involving reciprocal changes in non-current accounts only. Such a transaction has no effect on funds.**

- $\uparrow$  = increase in an account balance;
- $\downarrow$  = decrease in an account balance;
- $\leftrightarrow$  = if and only if;

$\rightarrow$  = implies,

Debit change or credit change in an account balance is used here as defined in standard accounting terminology. For a single transaction,  $\Delta_d$  will be used to indicate debit parts of the transaction and  $\Delta_c$  will be used to indicate credit parts.

**3.5. Set Theoretical Explanation to Funds Flow Statements:** The net change in working capital for a given accounting period may be calculated as follows:

$$\Delta CA - \Delta CL - \Delta L + \Delta OE - \Delta A \dots\dots\dots (1)$$

Equation (1) expresses the fact that the net change in funds must be equal to the algebraic sum of the changes in non-current accounts and can, therefore, be "explained" in terms of these changes; with some exceptions discussed below, debit changes in non-current accounts are uses of funds while credit changes are sources of funds. The mere listing of the changes in non-current account balances generally will not provide sufficiently detailed information for managerial purposes. Hence, in funds-flow analysis the terms on the right-hand side of equation (1) must be decomposed and/or regrouped into explanatory accounting classifications, each designated as either a source (or use) of funds or as having no effect on funds.

Therefore, we take the *set of changes in all account balances* as the *universal set* in the preparation of the *funds statement*. The universal set is first partitioned (as in Figure 2) into (1) changes in current account balances and (2) changes in non-current account balances. To explain the net change in funds we further form the partition  $\{S, U, T\}$  of the set of all changes in non current account balances. The set  $T$  has already been defined as transfers between non current accounts. The sets  $S$  and  $U$  are defined as follows:

**For Sources:**

$$x \in S \leftrightarrow x \in \Delta_c \text{ and } x \in \{ \downarrow A, \uparrow L, \uparrow CC, \uparrow R \} \text{ and } x \notin T,$$

where  $x$  stands for the credit change in any account balance or one of the component credit items in the net change in an account balance.

**For Uses:**

$$[y \in U] \leftrightarrow y \in \Delta_d \text{ and } y \in \{ \uparrow A, \downarrow L, \downarrow CC, \uparrow E, \uparrow DIV \} \text{ and } y \in T,$$

Where  $y$  stands for the debit change in any account balance or one of the component debit items in the net change in an account balance.

The above definitions serve to identify the sources and uses of funds. For example, a stock dividend declared is a transfer between non-current accounts and, hence, is neither a source nor a use of funds. Bad debts expense, on the other hand, involves a non current account (retained earnings) and a current asset valuation account; and it is, therefore, a use of funds within the definitions employed here. In general, the net change in each of two accounts—fixed assets and retained earnings—is effected by more than a single source or a single use of funds. Consequently, further analysis of these accounts is necessary in order to isolate all the sources and uses involved. For fixed assets (net of ' accumulated

depreciation), the following equation will serve (observe that the symbols below- are not intended to be sets but merely labels for the variables in an equation):

$$B_e = B_o + A - D - BVD,$$

where

$B_e$  = ending balance,

$B_o$  = opening balance,

$A$  = acquisitions,

$D$  = depreciation,

$BVD$  = book value of disposals = proceeds



+ Loss or - Gain.

Acquisitions are, of course, uses of funds; the current depreciation charges and the disposition of fixed assets, however, must be considered in relation to the retained earnings account. Since all revenue and expense accounts are subsets of retained earnings and since retained earnings is a subset of the non-current set, by transitivity of set inclusion, all revenue and expense accounts are also subsets of the non-current set. Consequently the provision for depreciation is a transfer between non-current accounts and does not, therefore, affect the funds position. The decrease in fixed assets upon disposal is combined with any gain or loss reflected in the retained earnings account to obtain the total funds from disposal. The decomposition of the net change in an account balance and the regrouping of terms are guided by the accounting meaning of the subtotals thus derived and the objectives of the analysis.

The analysis of the retained earnings account is also directed toward the segregation of transactions which affect the account balance. The net income for the period and dividends are generally the major items affecting the ending balance of retained earnings. While dividends are uses of funds, the net income figure customarily enters into the computation of "funds provided by operations" as a source of working capital. In determining the funds provided by operations, the conventional approach is to begin with the net income per income statement and make all necessary adjustments to it until the amount of funds provided by operations is obtained. An alternate approach is to list separately as sources all revenues which increase working capital, and as uses all expenses which decrease working capital. The definitions of sources and uses of funds given above are designed to implement this alternate method. Therefore, individual items of revenue and expense must be identified and classified as sources of funds, uses of funds, or as transfers between non-current accounts.

That is to say, retained earnings contains the effects of all revenue and expense accounts as a result of the closing process; hence, revenue and expense accounts may be considered subsets of retained earnings, that is,  $\{R, E\} \subseteq RE$ .

There are unusual situations where it is considered desirable to show a transfer between non-current accounts as both a source and a use of funds. For example, suppose real estate is exchanged for capital stock. Although this transaction will neither increase nor decrease the amount of funds, it might be deemed advisable to show the details of the transaction on the funds statement by assuming hypothetical intermediate cash exchanges. Such a situation could thereby be made to conform to the general definitions of sources and uses of funds that have been presented.

Finally, it might be mentioned that in some instances aggregation of accounts will lead to the destruction of subset information. For instance, there may be no net change in long-term, notes payable although those on the beginning balance sheet may have been refinanced. Had these accounts been disaggregated showing two different issues of notes, then both a source and a use would have resulted from the application of the definitions.

**3.6. Set Theoretical Explanations to Cash Flow Statements:** The basic logic of the preparation of the cash-flow statement is the same as that in the construction of the statement of sources and uses of working capital. While the term "cash-flow" has been used to refer to a variety of different concepts, we shall adopt here the common textbook definition of "cash" as the cash account balance. Let  $C$  = cash account, and  $A - C = G$  = non-cash assets. We can then rewrite equation (1) as

$$\Delta C = \Delta L + \Delta OE - \Delta C. \dots\dots\dots (2)$$

In terms of set theory, the universal set is here partitioned into:

$$\{\{\Delta C\}, \{\Delta L, \Delta OE, \Delta C\}\}.$$

The sources and uses of cash are elements of the set  $\{\Delta L, \Delta OE, \Delta C\}$  and are defined as follows :

$[x \in S] \leftrightarrow *x \in \Delta C$  and  $x \in \{\downarrow C, \uparrow L, \uparrow CC, \uparrow R\}$  and  $x$  is not merely a transfer between non-cash accounts :

$[y \in U] \wedge y \in \Delta_d$  and  $y \in \{\uparrow C, \downarrow L, \downarrow CC, \uparrow E, \uparrow DIV\}$  and  $y$  is not merely a transfer between non-cash accounts.

The similarities between these definitions and the previous ones are readily apparent; note especially the restriction on transfers. In general, depending on the definition of funds, this restriction might be worded, "w is not merely a transfer between NON-FUKD accounts." The same qualifications that were mentioned in our discussion of sources and uses of working capital apply to these definitions also.

It is easily seen that analysis of cash balance changes consists in the decomposition and/or regrouping of terms on the right-hand side of equation (2). The major step in this analysis is the derivation of the "net cash receipts from operations" which is the difference of "cash receipts from operations" and "cash disbursements for operations." For convenience, we will also refer to these terms as the "net profit or income on cash basis," "sales on cash basis," and "operating expenses on cash basis." The procedure followed is to make adjustments to the profit and loss items reported on an accrual basis." The following symbols will be used:

- S<sub>i</sub> = sales on basis i where i = a (accrual), c (cash);**
- AR = accounts receivable net of allowance for bad debts;**
- BD = bad debts expense;**
- E<sub>i</sub> = operating expenses on basis i, i = a (accrual), c (cash);**
- INV = merchandise inventory;**
- AP = accounts payable;**
- CS<sub>i</sub> = cost of sales on basis i, i = a (accrual), c (cash);**
- D = depreciation expense;**
- AE = accrued expenses;**
- PE = prepaid expenses.**

The cash receipts from operations is computed as follows:

$$S_c = (S_a - BD) - \Delta AR \dots\dots\dots (3)$$

There are two major components of "cash disbursements for operations," namely, "cash payments for purchases" (CS<sub>c</sub>) and "cash operating expenses" (E<sub>c</sub>). These are defined by the following formulae:

$$CS_c = CS_a + \Delta INV - \Delta AP, \dots\dots\dots(4)$$

$$E_c = E_a - (BD + D) + (\Delta PE - \Delta AE) \dots\dots\dots (5)$$

The "net cash receipts from operations" is then determined by

$$S_c - \{CS_c + E_c\}.$$

The "net cash receipts from operations" is also referred to as the "cash increase from operations."

If there exist other non-cash expenses, these will also have to be subtracted from the operating expenses on accrual basis {E<sup>^</sup>). The notation that has been employed in equations 3, 4, and 5 takes advantage of the sign of each change and is, therefore, compact.

Any remaining changes in current assets and in current liabilities will be treated in the same way as changes in non-current accounts, since the primary partition of the universal set is based on the dichotomy of "cash" and "non-cash" accounts. For example, an increase or a decrease in marketable securities will be listed as a separate use or source of cash. It is easy to see that, after the amount of net cash receipts from operations has been determined and any remaining changes in current accounts

properly classified, all other changes in non-current accounts are treated exactly as under the funds (working capital) statement.

**3.7. An Illustration to the Above Explanations:** A simple example illustrates the previous discussion. The comparative balance sheets and the profit and loss statement of a fictitious company are shown in Exhibit A. Assume that reconstruction of the property and retained earnings accounts of the company shown:

Opening balance	80,000	Depreciation	12,000
Equipment purchases	87,000	Book value of equip, sold—	5,000 (A)
		Closing balance	150,000
	1,67,000		1,67,000

(A) Book value of disposals = \$5,000 = Cost (\$25,000) — accumulated depreciation (\$20,000) - Loss on sale of equipment (\$3,000) + proceeds from sale (\$2,000)

Dividends	30,000	Opening Balance	80,000
Closing balance	115,000	Net income	65,000
	1,45,000		1,45,000

Increasing and decreasing changes, the equations could be rewritten as follows:

$$\begin{array}{l}
 S_c = S_a + \begin{array}{c} \downarrow \\ \text{AR} \\ \uparrow \\ \text{AR} \end{array} - \text{BD} \dots\dots\dots (3') \\
 CS_c = CS_a + \begin{array}{c} \uparrow \text{INV} \\ \downarrow \text{INV} \end{array} + \begin{array}{c} \downarrow \text{AP} \\ \uparrow \text{AP} \end{array} \dots\dots\dots (4) \\
 E_c = E_a + \begin{array}{c} \uparrow \text{PE} \\ \downarrow \text{PE} \end{array} + \begin{array}{c} \downarrow \text{AE} \\ \uparrow \text{AE} \end{array} - \text{BD} - \text{D} \dots\dots\dots (5)
 \end{array}$$

This numerical illustration is adapted from A. Wayne Corcoran, "A Simplified Worksheet for the Funds and Cash-Flow Statements," *NAA Bulletin*, Sept. 1964, pp. 35-40.

**Table 1: Statement For The Calculations Of Funds From Operations For The Year Ended 31<sup>st</sup> March 2012**

Particulars	Amount in crores
<b>Fund from Operations</b>	
Net profit as per P/L account	11713.34
<b>Adjustments for</b>	
<b>Add:</b> Provision for Taxation	6776.02
<b>Net Profit before Tax</b>	<b>18,483.36</b>
<b>Add:</b> Depreciation Debited to p/l account	1007.16
<b>Add:</b> Provision for Depreciation in Investment	663.70
<b>Add:</b> Provision for Standard Asset	978.81
<b>Add:</b> Provision for NPA	11545.85
<b>Add:</b> Interest on capital Paid	3592.20
<b>Add:</b> Other Provision Written off	(98.13)
<b>Less:</b> Dividend from Subsidiaries / joint venture	767.35
<b>Add:</b> Loss on sale of Fixed Asset	44.15
<b>Add:</b> Loss on sale of Investment	919.74
<b>Net Fund Flow from Operations</b>	<b>36369.49</b>

**Table 2: Changes as Per Cash Flow Statement**

<b>Changes As Per Current Assetes:</b>	<b>RS.('000)</b>	<b>RS.('000)</b>
Cash & Balance With Rbi	-403195634	
Balance With Bank & Call Money	146085806	-257109828
Investments		173120378
Advances		1221480724
Other Assets		78972360
<b>Sub-Total (A)</b>		<b>1216463634</b>
<b>Changes As Per Current Liabilities:</b>		
Deposits		1092347620
Borrowings		70442726
Other Liabilities		-250509748
<b>Sub Total-(B)</b>		<b>912280598</b>
<b>Net Changes In Working Capital=(A-B) [ΔCA - ΔCL]</b>		<b>304183036</b>

Increasing and decreasing changes, the equations could be rewritten as follows:

$$S_c = S_a + \begin{matrix} \downarrow \\ \text{AR} \end{matrix} - \text{BD} \dots\dots\dots (1)$$

$$CS_c = CS_a + \begin{matrix} \uparrow \\ \text{AR} \\ \uparrow \text{INV} \end{matrix} + \begin{matrix} \downarrow \\ \text{AP} \end{matrix} \dots\dots\dots (2)$$

$$\begin{matrix} \downarrow \\ \text{INV} \end{matrix} + \begin{matrix} \uparrow \\ \text{AP} \end{matrix}$$

$$E_c = E_a + \begin{matrix} \uparrow \\ \text{PE} \end{matrix} + \begin{matrix} \downarrow \\ \text{AE} \end{matrix} - \text{BD} - \text{D} \dots\dots\dots (3)$$

$$\begin{matrix} \downarrow \\ \text{PE} \end{matrix} + \begin{matrix} \uparrow \\ \text{AE} \end{matrix}$$

**Table 3: Funds Flow Statement As On 31.03.2012.**

<b>Sources Of Fund</b>	<b>Rs.('000)</b>	<b>Application Of Fund</b>	<b>RS.('000)</b>
Fund From Operation	363694532	Change In Working Capital	304183036
Issue Of Equity Shares	78913087	Interest Paid On Capital Instruments	35922091
Income On Investment	7673515	Tax Paid	87087529
Effect Of Exchange Fluctuation On Translation Reserve	22170951	Increase In Fixed Assets	17103468
Net Cash And Cash Equivalent Taken Over From Erstwhile Sbici Bank Limited On Amalgamation	414122	Increase In Investment In Subsidiaries ,Jv, Associates	7055695
		Dividend Paid Including Tax	21514388
	<b>472866207</b>		<b>472866207</b>

**4.1. Set Theoretic Explanations to the Above Statements:** Let us use the following Notations :

**For Sources of Funds:**

FO = Funds from Operations

ES = Issue of Equity Shares

II = Income on Investments

TR= Effect of Exchange Fluctuation on Translation Revenue

CE=Net Cash and Cash Equivalent taken over from erstwhile State Bank of India Limited on Amalgamation.

S= Sources of Funds

**For Uses or Applications of Funds:**

CWC = Changes in Working Capital

ICI = Interest paid on Capital Investments

TP = Tax Paid

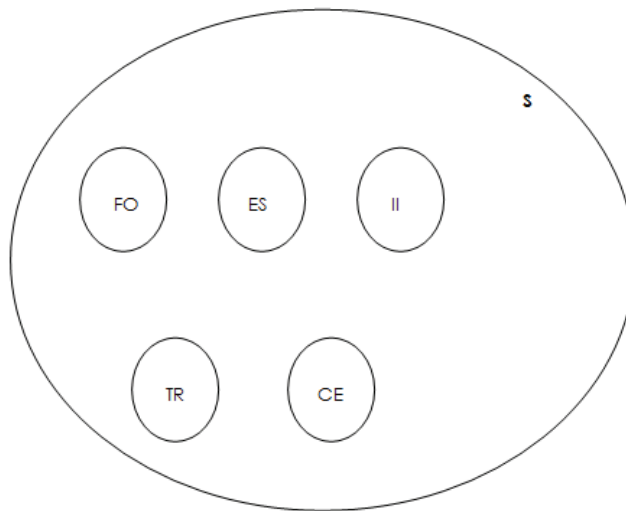
IFA = Increase in Fixed Assets

IIS = Increase in Investments in Subsidiaries, Joint Ventures, Association etc.

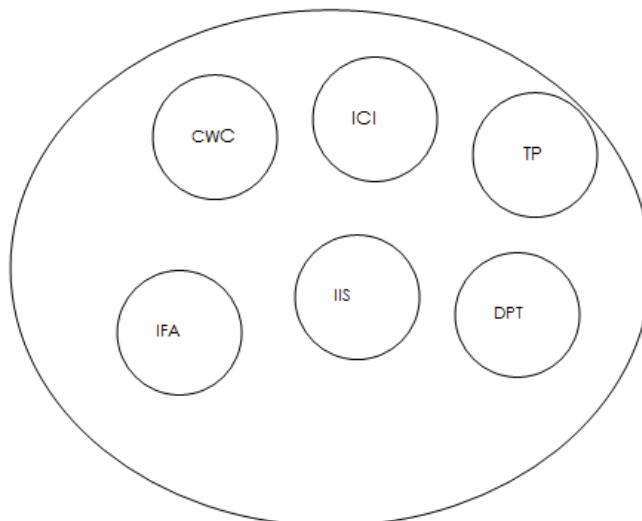
DPT = Dividends paid including Tax

A= Applications of Funds

From the above notations, we draw the following Venn Diagrams 1 & 2. In Venn Diagram 1, S denotes the Sources of Funds as Universal Set and in Venn Diagram 2, A denotes the Applications of Funds as Universal Set.



Therefore,  $S = FO \cup ES \cup II \cup TR \cup CE \dots\dots\dots (1)$



Therefore,  $CWC \cup ICI \cup TP \cup IFA \cup IIS \cup DPT \dots\dots\dots (2)$

As,  $S = A,$

Therefore,  $Eq. (1) = Eq. (2),$

i.e.,  $(FO \cup ES \cup II \cup TR \cup CE) = (CWC \cup ICI \cup TP \cup IFA \cup IIS \cup DPT)$ .

**For Net Changes in Working Capital:**

$\Delta CA$ = Changes in Current Assets

C= Cash

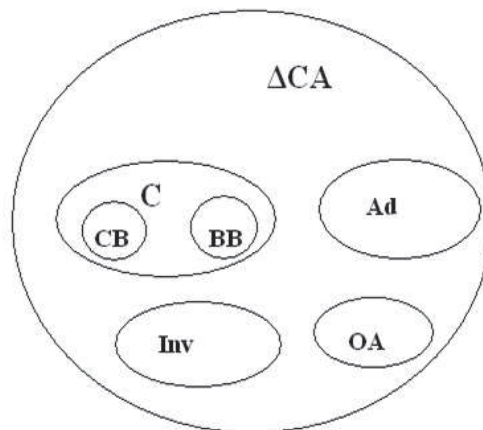
└─┬─> CB= Cash Balance with RBI  
     BB= Balance with Bank and Call money

Ad= Advances (increase)

Inv= Investments (Other than investments in subsidiaries/JV/associates)

OA= Other Assets

From the above notations, we draw the following Venn Diagram



And again,

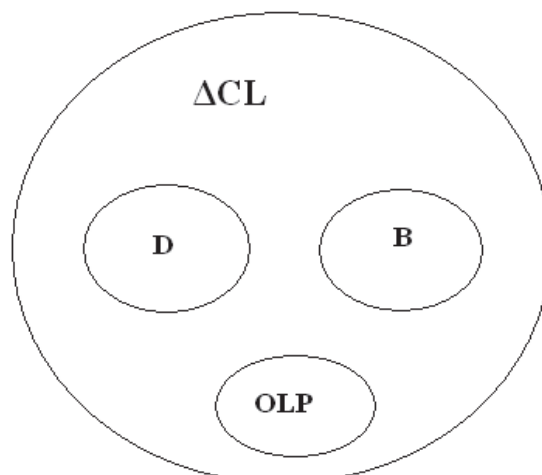
$\Delta CL$ = Changes in Current Liabilities

D= Deposits

B= Borrowings

OLP= Other Liabilities & Provisions

From the above notations, we draw the following Venn Diagram



Therefore, Net Changes in Working Capital =  $\Delta CA - \Delta CL$

**4.1. Findings from the Above Study:** From the above analysis, we see that the sources and applications of funds and the universal sets S and A respectively and their different sources and sub-sources are

denoted as different subsets, which may be equal or equivalent, depending on their nature of explanation. Therefore, the portion of NPA or Standard Asset etc. could be easily measured as a subset of the total sources of funds or its applications, for example, and their changes should be equated or derivated to find the net **pie**, instead of traditional accounting calculations. This may show us some new ways to the analysts as how to explain the financial statements and their changes.

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