PROJECT PLANNING TECHNIQUES

There are varied **project plan methods** or **techniques** that can be employed in project management to obtain the **desired deliverables.** Some of these include: **Logical Framework, Work Breakdown Structure, Project Network and Critical Path Analysis.**

1. **WORK BREAKDOWN STRUCTURE**

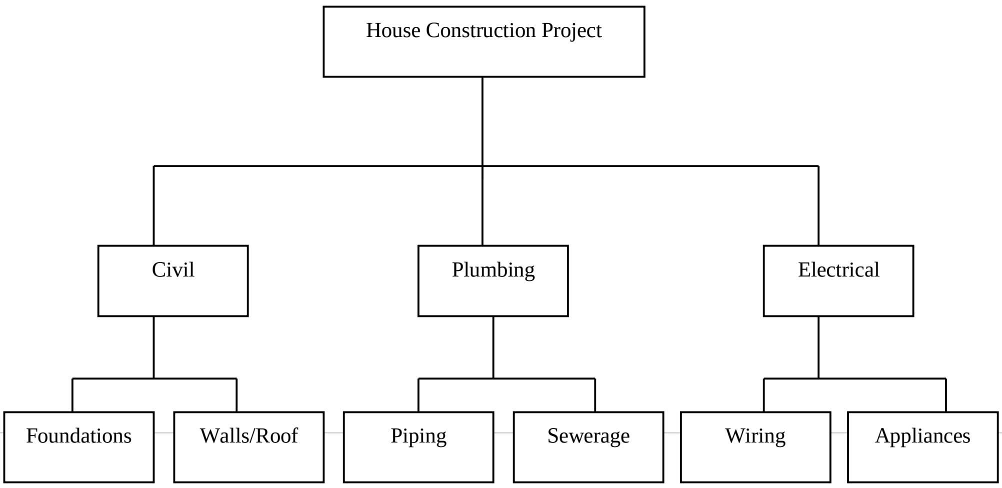
Previously, we said that **planning answers the questions** "**What must be done?**", "**How long will it take?",** and "**How much will it cost?"** among other questions. Projects frequently fail because a significant part of the work is forgotten. In addition, once tasks have been identified, the **time** and **resource** requirements must be determined**.** This is called *estimating* (This will be looked at later in the course).

A major challenge in **project planning** is **determining how long tasks** will take and **what it will cost to do them**. Inaccurate estimates (of cost, time, etc.) are a **leading cause of project failures**, and missed **cost targets are a common** cause of stress in project management.

One of the most useful tools for effective project planning is the work breakdown structure (WBS). The idea behind the WBS is simple: You sub-divide a **complicated task** into **smaller tasks** until you reach a level that cannot be further subdivided. It is usually easier to estimate how long the small task will take and how much it will cost to perform than it would have been to estimate these factors for the higher levels (Kerzner, 2009).

This technique as the name implies, **breaks down the work into smaller components**; and at the same time establishes connections between components (parts). In other words, the WBS defines the **various project sub-activities** in relation to the project result. Nevertheless, it is still not easy to estimate task durations for activities that have never been performed before (hence, the need to draws lessons learnt). This is the typical situation in engineering hardware and software development projects**.** In such cases, we might expect many errors when estimating (Kerzner, 2009).

Example of a work break down structure for house construction



Still, the **Work Breakdown Structure** makes it easier to estimate knowledge tasks than any other tool we have. Note that we do not worry about the sequence in which work is performed when creating a WBS. Sequencing will be worked out when developing a schedule. However, it is always possible to think sequentially, as it seems to be human nature to do so. Note: The main aim of doing a WBS is to **capture all of the tasks to be done**. So if you find yourself and other members of your team thinking sequentially, don't be too concerned, but don't get hung up on trying to diagram the sequence or you will slow down the process of task identification (Kerzner, 2009).

A **Work Breakdown Structure** does not **show the sequence** in which **work is performed**. The typical WBS has three to six levels; it is, of course, possible to have **projects that require a lot more levels**. Twenty levels are considered to be the **upper limit**, and that is a **huge project.** Note that level 1 is usually called the ***program*** **level.**

Guidelines for Developing the WBS

One important question in constructing a WBS is "When do you stop breaking down the work?"

The general guideline is that you stop -

1. When you reach a point where either you can estimate time and cost to the desired degree of accuracy or;

2. When the work will take an **amount of time equal to the smallest units** you wish to schedule. For example, if you want to **schedule to the nearest day**, you break down the work to the point **where tasks take about a day to perform.** If you intend to **schedule to the nearest hour**, then you stop when **task durations are within that range.**

NOTE: Stop breaking down work when you reach a low enough level to do an estimate of the desired accuracy. **Remember:** the rule is that people who must do the work should participate in planning it. Usually, a core group identifies top-level parts of the WBS; those parts are further refined by other members of the team and then integrated to obtain the entire WBS.

NOTE: the WBS should be developed before the schedule.

The WBS is the device that ties the entire project together. WBS allows the **project manager** to **allocate resources** and to **estimate time and costs for the entire project.** It depicts the **project scope** in graphic form. Later, as the **project is monitored**, the task can be identified as falling in a particular box in the WBS.

One software package, SuperProject Expert™, prints a WBS after schedule data have been entered. **Emphasis:** The WBS should always be developed before the schedule is worked out, but without trying to identify the sequence of activities. Until all project team members have agreed that all project tasks have been identified, it is not necessary to develop a schedule because it can be misleading. You cannot be sure that the critical path identified by a partial schedule will be the same for the full schedule.

There are a number of approaches to developing the WBS. Ideally, you proceed top-down, after the project has been defined. However, the mind does not always operate in such nice, linear fashion; as you develop the WBS, in practice, it is a back and forth exercise. The best advice is, **the project manager and his/her team** should do what works best for them. The WBS does not have to be **symmetrical**. That is, all paths (levels) need not be broken down to level 6 (or whatever level you stop at). Since the rule is to break work down to a level sufficient to achieve the estimating accuracy you desire, one path may take six levels, while another may need only three (Kerzner, 2009).

Uses of the WBS

i. The WBS is a good way to show the project scope. When you show a project in WBS form, it is clear to most individuals why the job costs so much.

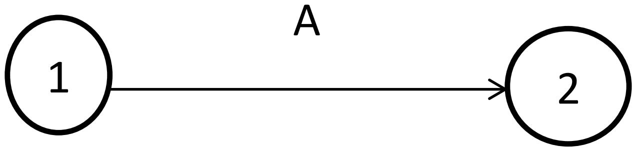
ii. **Assigning responsibility for tasks** is another important use of the WBS. Each task to be performed should be assigned to a particular person(s) who will be responsible for its completion. These assignments can then be **listed on a separate form**, often called a **responsibility chart.**

2. PROJECT NETWORK AND CRITICAL PATH ANALYSIS

Basically the network is a flow diagram showing the sequence of operations (activities) of a project. Each individual operation is known as an activity and each meeting point or transfer stage between one activity and another is an event or node. If the activities are represented by straight lines and the events by circles (boxes), it is very simple to draw their relationships graphically, and the resulting diagram is known as the network.

In order to show which activity has to be performed before its neighbour, arrow heads are placed on the straight lines, but it must be explained that the length or orientation of these lines is quite arbitrary.

It can be seen, therefore, that each activity has two nodes or events, one at the beginning and one at the end.



Thus events 1 and 2 in the figure show the start and finish of activity A.

The arrow head indicates that 1 comes before 2, i.e. the operation flows towards 2.

We can now describe the activity in two ways:

1. By its activity title (in this case, A)

2. By its starting and finishing event or nodes 1–2.

For analysis purposes, the second method must be used.

WHEN TO USE NETWORK ANALYSIS TECHNIQUES

The network analysis can be applied at three major levels in the project management circle:

1. Planning the Project

Here, it is used to analyse the project by determining all the individual activities, and to show the planned sequence of these activities on a network.

2. Scheduling the Project

a. It is used to estimate how long it will take to perform each activity.

b. Perform computations/ calculations to locate the critical path.

This process will also provide information for scheduling, which can be used to develop an economical and efficient schedule for the project.

3. Monitoring the Project

Both the project plan and the network can be used to control and monitor progress, and revise and update the schedule during project implementation so that the schedule represents the current plans and current status of the project.

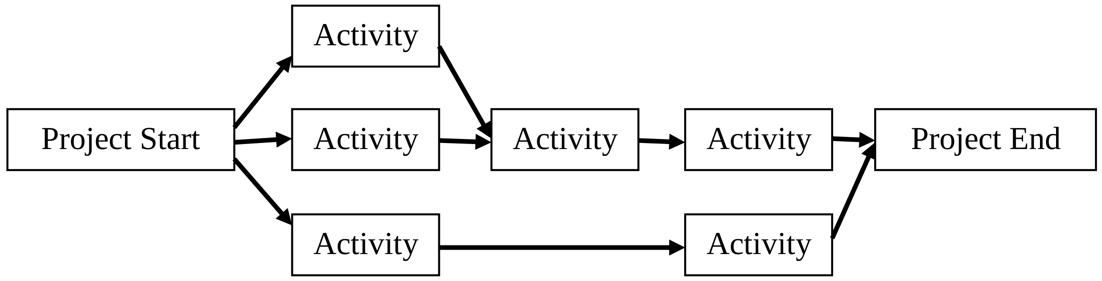
SYMBOLS AND TERMINOLOGIES USED IN PROJECT NETWORK

To structure a project network and define a standard which many people are able to use, certain terminologies are defined for use in project networks.

Network diagram or the Precedence Diagram Method (PDM):

Network diagram or PDM may be defined as a graphical presentation of the project's activities showing the planned sequence of work (Figure 9).

Figure 1: Example of a Project Network Plan



<u>Activity:</u> This is a task, job or operation that must be performed to complete the work package or project (or achieve goals of a project). The other important point to note is, an activity needs time to be completed. In the network diagram, an activity is always represented by an identity number, which can be alpha and/or numeric and is presented in a box (Figure 1).

Activity by (arrow) can have any size of slope. This start from tail and ends at the head of the arrow.

Dummy activity (broken arrow) consumes no time. This is introduced to avoid dangling. This happens when an activity ends without being joined to end event, thus breaking continuity. An activity has resources like personnel, budget, space and, in most instances, relationships.

Source: Lester et al (2003). Project Planning and Control

An activity in a project network shows which tasks have to be performed in order to proceed, which resources are needed and how many of them.

<u>An event</u>: is something which does not consume project time, but it connects two or more activities. It can be seen as a date that defines the start of an activity or when a deliverable is made. It is generally represented on the network by circle, rectangle or hexagon. Events may be classified into three categories: merge event, burst event, or merge and burst event (Figure 1).

<u>Float or Slack:</u>

Generally, the two are used interchangeably. ***Float or slack*** is defined as an amount of time an activity can be delayed without affecting the duration of the entire project. On the critical path, the float is zero (0). i.e. all activities on the critical path have to be performed within the planned time if the project is to be completed according to schedule. An activity with little float has a higher likelihood of delaying the project and should be carefully monitored.

<u>Total duration:</u> Total duration of time available for any activity is the difference between its Earliest Start time and the Latest Finish time. TD= ES-LF

<u>Earliest Start Time (ES):</u> This is the earliest occurrence time for the event from which the activity arrow originates.

Earliest Finish Time (EF): This is the earliest occurrence time for the event from which the activity arrow originates plus duration for the activity. EF = ES + t

Latest Start Time (LS): This is the latest occurrence time for the event at which the activity arrow terminates minus the duration for the activity

LS = LF – t

Latest Finish Time (LF): This is the latest occurrence time for the event at which the activity arrow terminates.

The critical path: is the path of the network that has the longest expected completion time and is expected to determine the completion date of the project. A critical path is a chain of sequential activities beginning with the project start and ending with its completion. Several paths may exist through the network. Often, activities that are not on the critical path can be delayed without causing a delay in the completion of the project. On the other hand, activities on the critical path, if delayed, cause delay in the entire project. In other words, there is no float along the critical path.

ES = Early Start time of activity

EF = Early Finish time of activity

LS = Late Start time of activity

LF = Late Finish time of activity

t = duration of the activity considered

TF = Total Float

FF = Free float

IF = Independent float

BASIC RULES APPLIED IN NETWORK CONSTRUCTION

Before proceeding further it may be prudent at this stage to list some very simple but basic rules for network presentation, which must be adhered to rigidly:

1. Where the starting node of an activity is also the finishing node of one or more other activities, it means that *all* the activities with this finishing node must be completed before the activity starting from that node can be commenced. For example, in Figure 11.2, 1–3(A) and 2–3(B) must be completed before 3–4(C) can be started (Lester et al, 2003).

2. Each activity must have a different **set** of starting and finishing event numbers. This poses a problem when two activities start and finish at the same event, and means that the example shown in Figure 11.3 is incorrect. In order to apply this rule, therefore, an artificial or 'dummy' activity is introduced into the network (Figure 11.4) (Lester et al, 2003).

This 'dummy' has duration of zero time and, thus, does not affect the logic or overall time of the project. The dummy's function is to show that all the activities preceding it, must be completed before the next activity/ activities. It can be seen that activity A still starts at 1 and takes 7 units of time before being completed at event 3. Activity B also still takes 7 units of time before being completed at 3 but it starts at node 2. The activity between 1 and 2 is a timeless dummy.

3. Each activity (except the last) must run into another activity. Failure to do so creates a loose end or 'dangle' (Figure 11.6). Dangles create premature 'ends' of a part of a project, so that the relationship between this end and the actual final completion node cannot be seen. Hence the loose ends must be joined to the final node (in this case, node 6 in Figure 11.7) to enable the analysis to be completed (See Lester et al., 2003).

4. No chain of activities must be permitted to form a loop, i.e. such a sequence that the last activity in the chain has an influence on the first.

Clearly, such a loop makes nonsense or any logic since, if one considers activities 2–3(B), 3–4(C), 4–5(E) and 5–2(F) in Figure 11.8, one finds that B, C and E must precede F, yet F must be completed before B can start. Such a situation cannot occur in nature and defies analysis. (See Lester et al., 2003).

5. Network flow should typically move from left to right. This common approach ensures that the project team knows how to read the network.

6. Arrows must be drawn in straight lines, therefore, there is need to avoid curved lines and crossing of activities.

7. An activity can only appear once in the network: there should be no duplication of activities. Each activity is represented by one and only one arrow in the network.

8. Arrows on networks indicate precedence and flow; they cannot cross.

To show the flow of the process and to show which tasks have to be done, arrows are used.

9. Each activity has to have a unique identification number or letter. Numbering should be done in ascending order from left to right. The number of the activity shows the work flow.

10. An event cannot occur until all activities leading to it are completed and no activity can begin until its immediate preceding event has occurred (See Lester et al., 2003).

TYPES OF PROJECT NETWORK DIAGRAM

1. ACTIVITY ON ARROW (AOA) DIAGRAM

Activity on arrow (AOA) shows the activities as arrows and use circles or rectangles to connect predecessor and successor activities. With AOA, the circles or the nodes represent events which are points in time at which activities begin or end. A network is drawn after all activities and their relationships have been defined and identified. The activity that must be performed just before a particular activity is its ***predecessor*** activity; the one that follows is its ***successor*** activity.

Activities, which can be accomplished concurrently, are known as ***concurrent*** activities. An activity in the AOA diagram is often identified by numbers indicating the starting and ending events

2. PRECEDENCE OR ACTIVITY ON NODE (AON) DIAGRAMS

Some planners prefer to show the interrelationship of activities by using the node as the activity box and interlinking them by lines (Lester et al., p.82). Because the durations are written in the activity box, dummy activities are eliminated. In a sense, each connecting line is, of course, a dummy because it is timeless.

The network produced in this manner is known as 'Precedence Diagram', or a 'Circle and Link Diagram' or an 'Activity on Node Diagram'.

Precedence diagrams have a number of advantages over arrow diagrams in that:

1. No dummies are necessary;

2. They may be easier to understand by people familiar with flow sheets;

3. Activities are identified by one number instead of two so that a new activity can be inserted between two existing activities without changing the identifying node numbers of the existing activities;

4. Overlapping activities can be shown very easily without the need for the extra dummies.

EARLIEST TIMES (E)/ FORWARD PASS AND PROJECT DURATION

- The overall project duration is calculated by taking the "earliest time" each event can occur.
- This is the "earliest times" for the preceding event plus the duration of the corresponding activity.
- The project is assumed to start at time zero and therefore, the earliest event time for the first activity is also zero.

- If you obtain more than one “Earliest time” value for an event, choose the highest value.

LATEST TIMES (L) BACKWARD PASS

- Backward pass involves calculating the “Latest times” (L) for each event.
- This is done in much the same way as calculating the “Earliest times” with one exception.
- Working backward from the finish event, make the “latest event time” for the last activity equal the project duration.
- The latest time (L) for an event is the “Latest time” of the succeeding event minus the corresponding duration.

STEPS TO BE FOLLOWED WHEN DEVELOPING A NETWORK

1. Identify all activities to be undertaken
2. Estimate the duration of each activity
3. Establish precedence among the activities
4. Determine which activities can be performed concurrently

Time estimate for the construction of Levy Mwanawasa Hostels

Activity	Description	Preceding Activity	Duration (in days)
A	Apply for approval	None	5
B	Clearing building space	A	5
C	Digging foundation	B	10
D	Gathering materials	B	5
E	Building Foundation	C,D	15
F	Building walls	E	20
G	Building roof	F	5
H	Plumbing	G	10
I	Electrical	G	5
J	Fine tuning	H,I	5

To start the forward pass computation, a start time has to be determined. In this case, the start time is 0.

To compute the early finish (EF) for activity B, the formula ES + Duration = EF is used.

EF (B) = 5 + 5 = 10

EF (C) = 10 + 10 = 20

EF (D) = 10 + 5 = 15

Figure 1: Forward pass computations in the construction of Levy Mwanawasa Hostel

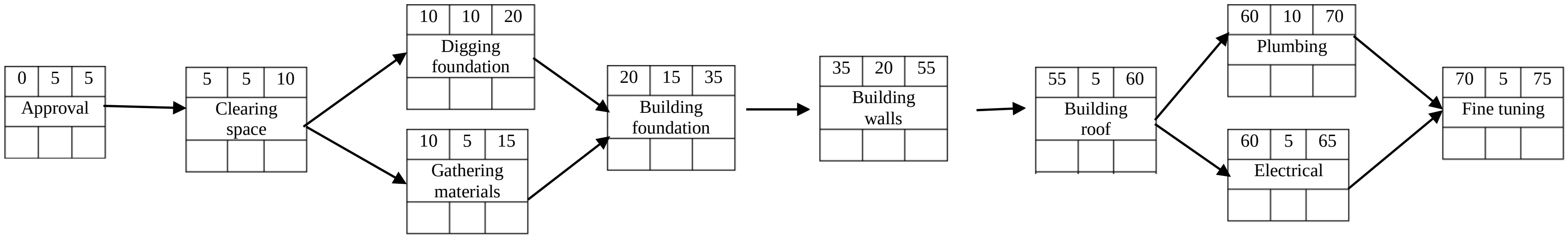
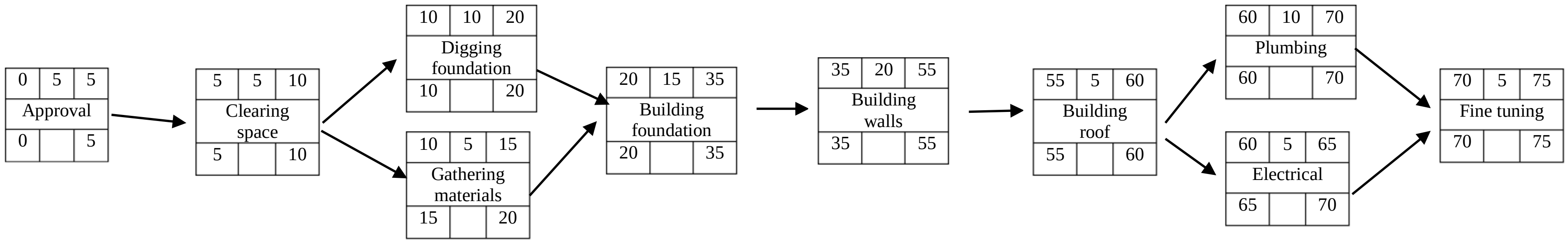


Figure 2: Backward and forward pass computations in the construction of Levy Mwanawasa Hostel



RULES FOR FORWARD PASS COMPUTATIONS

a) Activity times along each path in the network (ES + Duration = EF) are added to the respective durations.
b) The Early Finish (EF) for the preceding activity is carried to the next activity where it becomes its Earliest Start (ES), unless;
c) The next succeeding activity is a merge activity. In this case, the largest Early Finish number (EF) of all its immediate predecessor activities is selected.

BACKWARD PASS – LATEST TIMES

The backward pass calculations starts with the last project activity on the network. Each path is traced backwards and the activity durations are subtracted from the activity times to find the Late Start (LS) for each activity. Before the backward pass can be computed, the Late Finish (LF) for the last project activity must be determined. This is (i.e. LF) usually equal to the Early Finish (EF) of the last project activity (or in the case of multiple Early Finish times, it is one with the largest value). In some cases, an imposed project duration deadline exists, and this date will be used.

Rules for backward pass computations

d) Activity durations are subtracted from the activity times of the respective activities along each path starting with the project end activity (LF - Duration = LS)
e) The Late Start (LS) for the respective activity is carried to the next activity to establish its Late Finish (LF), unless.
f) The next preceding activity is a burst activity. In this case, you select the smallest LS of all its immediate successor activities to establish the LF.

DETERMINATION OF SLACK OR FLOAT AND CRITICAL PATH

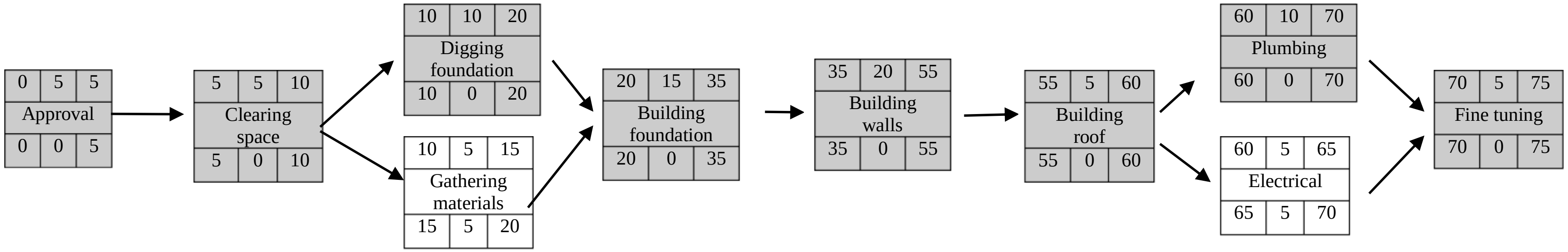
When the forward and backward passes have been computed, it is possible to determine which activities can be delayed by computing ‘slack’ or ‘float’. The total slack or float for an activity is simply the difference between the LS and ES (LS –ES =SL) or between the LF and EF (LF – EF = SL)

E.g.: SL (J) = LF – EF (75 – 75 = 0)

The slack gives information about the amount of time an activity can be delayed without delaying the whole project.

The **critical path** in the Levy Mwanawasa hostels example is represented by the activities highlighted or in bold.

Figure 3: Determination of Slack or Float and Critical Path



3. LOGICAL FRAMEWORK APPROACH

The Logical Framework Approach (LFA) is one of the principal tools used by organisations nowadays to design and plan for their projects and programmes. The logical framework is a 4 column by 4 row matrix which provides a framework within which the evaluator can examine aspects of a project's performance at all stages of the project. The framework is based on two basic principles:

Firstly, **cause-effect relationships** between different parts of a problem which correspond to the four levels (or rows) of the framework.

These four levels (rows) relate to activities (or inputs), components (or outputs), the purpose and the goal as the set of hierarchical project objectives;

Second, the **principle of correspondence**, which links the four levels of objectives to the measurements of achievement (indicators and means of verification) and conditions (risks or assumptions) which may affect the achievement of project objectives. Refer to Table 1.

Table 1 shows that, if you want to achieve a certain goal; you have to work with all boxes in the matrix to achieve it both horizontally and vertically. The cells of the matrix contain text that will in a few words describe the most important features of a project. There is a logical connection between the cells of the matrix. The logic that connects the cells in the left most columns is referred to as the **vertical logic**; the logic that connects the remaining three columns is referred to as the **horizontal logic**.

For example, if the project delivers those outputs (or components), and the assumptions hold (assumptions made are constant), then the purpose (a hypothesis) will be achieved (i.e., the outputs are necessary and sufficient conditions for the achievement of project purpose). And, if the purpose is achieved, and the assumptions at the purpose level hold, you will have contributed significantly to the attainment of the goal.

VERTICAL LOGIC

The vertical logic of the Log frame identifies what the project intends to do. The vertical logic is the hierarchy of objectives of the project.

It also shows the casual relationship between the different levels of the objective system (column 1) and the assumptions and risks (column 4) that are beyond the control of project management (Table in the print out).

For example, Table 1 of the vertical logic postulates that if we contribute certain inputs we will deliver certain outputs: thus, there is a necessary and sufficient relationship between inputs and their corresponding outputs, as long as the assumptions are confirmed in reality.

HORIZONTAL LOGIC

The horizontal logic describes the following:

1. How the achievement of the objectives will be measured or verified;

2. How this information will be obtained;

Table 1: The structure of the logical framework

Strategy of intervention	Indicators	Means of Verification	Assumptions/Risks
GOAL/Impact The Goal is a statement of how the project or program will contribute to the solution of the problem (or problems) of the sector. *To reduce pathogenic disease transmission by improving health standards*	The indicators at Goal level describe how the overall impact of the project shall be measured. They are specific in terms of quantity, quality, and time (target group and location if relevant). *Waste collectors established and operational (date)* *Number of CBEs managing waste collection (specify)* *Channels of communications created on status of sanitary facilities in use(date)*	The means of verification are the sources of information that can be used to verify that the targets were achieved. They can include published material, visual inspection, sample surveys, etc. *Site visits, MoU or Reports on status*	
PURPOSE/Outcome The Purpose is the direct impact to be achieved as a result of the Outputs produced by the project. It is a hypothesis about the impact or benefit that the project attempts to achieve. *To improve collection of waste, correct and clean use of sanitary facilities at the University of Zambia for improved health and hygiene among students*	The indicators at the Purpose level describe how the direct impact of the project shall be measured. They should include targets reflecting the end of project status (EOPS). They are specific in terms of quantity, quality, and time (target group and location if relevant). *Reduced diarrhoea cases of UNZA students at UNZA clinic (specify, e.g %)*	The means of verification are the sources to which that the executor and evaluator can refer to see if the targets are being achieved. They can indicate that there is a problem and suggest the need for changes in project Outputs. They can include published material, visual inspection, sample surveys, etc. *Clinical records* *Interviews (students and clinic management)*	The assumptions indicate the events, conditions, or decisions that must occur in order for the project to contribute significantly to the achievement of the Goal. *Voluntary participation by all stakeholders to keep UNZA clean* *Penalties to individuals not adhering to stipulated cleanliness measures*
OUTPUTS These are the goods, services, and training that the project executor is required by contract to complete. They should be expressed as work completed (systems installed, people trained, etc.) *Refuse bins available*	The indicators for Outputs are concise, but clear, descriptions of <u>each of the Outputs that has to be completed during execution</u>. Each should specify quantity, quality and timing of the goods, services, etc. to be delivered. *# of CBEs present (number and date)*	This cell tells where an evaluator can find the sources of information to verify that the products/services contracted have been delivered. Sources can include site inspection, auditor's reports, etc. *Site inspection* *Receipts*	The assumptions are the events, conditions, or decisions that have to occur in order for the Outputs to achieve the Purpose for which they were undertaken. *CBEs on site collecting garbage* *Correct use of refuse bins by users*

CBEs present Users trained O&M of sanitary facilities	*Refuse bins available (number and date)*		
ACTIVITIES Activities are the tasks that the executor must carry out in order to produce each of the Outputs of the project and that denote costs. Activities are listed in chronological order for each Output. *Buy refuse bins* *Engage and train CBEs on waste collection* *Train users on O&M of sanitary facilities*	The indicators at activity levels are the actual processes and/or activities undertaken. *For example, number and cost of refuse bins bought, number of CBEs trained, etc.*	This cell tells where an evaluator can obtain information on whether the budget was spent as planned. It is usually the accounting records of the executing unit. *Audit reports* *Financial reports*	The assumptions are the events, conditions, or decisions that have to occur in order to complete the Outputs of the project. *Refuse bins bought* *CBEs trained* *Users of sanitary facilities trained*

3. What external factors could prevent the project manager and staff from achieving the next level objective?

In practical terms, the horizontal dimension is a description of how project managers and staff responsible for monitoring and evaluating the project, would measure the attainment of expected results.

In Table 1, the second column includes what are called **"indicators".**

These are predetermined, quantitative and/or qualitative measures that indicate the status of inputs or outputs delivered, the achievement of the purpose (project impact) or the extent of contribution toward attainment of the goal.

The third column explains how they will be measured, by specifying sources of information and methods to be employed.

The fourth column describes the assumptions or risks that must hold in order to ensure the achievement of the activities or products of each level, and to proceed to the next level in the hierarchy of objectives. The logical link between indicators and objectives is referred to as the horizontal logic of the LF. The horizontal logic is important for testing the project description. During the process of defining performance indicators, it is necessary to revisit the quality and appropriateness of project objectives (are they clear, feasible or specific enough?) It may be necessary to adjust the objectives in an interactive process.

INDICATORS

Indicators provide the focus for evaluation during data collection, so they need to be specified carefully. The logical framework must include indicators for all the important objectives, but, at the same time, indicators should be chosen carefully to ensure their measurability.

In setting indicators, the quantity, quality and timing required to achieve the next level of objectives must be considered. Indicators are very important because they provide an operational response to the problem, need or opportunity being addressed by the project. Furthermore, they provide a focus for data collection at the preparation stage and a map to guide project monitoring and evaluation later on.

EXTERNAL FACTORS/ ASSUMPTIONS/RISKS

These refer to conditions which can influence the progress or success of the project, but over which the project team has no direct control. For example, delay in the delivery of project materials by suppliers would be considered a risk. Assumptions are positive statements about the conditions that need to be met if the project is to stay on track. The assumptions could be that refuse bins would be bought and delivered on time.

Understanding and analysing assumptions is an important part of the planning process and helps in improving project design.

WHEN TO USE THE LFA

The LFA can be used throughout the project management cycle, i.e. initiation, planning, implementing, monitoring and evaluating projects. It can also be used to conceptualise projects. Above all, it has the potential for widespread and flexible application.

STRENGTHS OR IMPORTANCE OF THE LFA

Establishes a causal link between inputs, processes, outputs, outcomes and objectives (This is what is called ***vertical logic***). LFA also offers specifications of inputs and costs for project activities. It also offers a clear **means-ends analysis** of project inputs leading to outputs for set purposes in support of a goal. It is a means to objectively verify indicators of performance and sources of verification. It helps in specifying potential key assumptions or risks underlying the project; It provides a framework for introducing lessons learned to be incorporated in future projects (i.e. establishing a system for monitoring and evaluating project performance). Establishes a communication and learning process among the project stakeholder, (i.e. clients /beneficiaries, planners, decision makers and implementers). It offers an opportunity to project designers to better understand the problems they are trying to solve.

LIMITATIONS OF THE APPROACH

In order to fully realise the strengths and potential of the LFA, it is important to be aware of its limitation. Sometimes reality on the ground cannot be managed only on the basis of logical or rational analysis. Therefore, there is need for alternative and supplementary tools and procedures because projects operate in a complex environment.