SCHEDULING AND COST ANALYSIS PROGRAM FOR PROJECT MANAGEMENT

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Synopsis

This article describes the important element involved in project management, especially the construction works. The methods are based on the network analysis techniques. The designed package is capable to perform the scheduling of the project's activities and the calculation of various costs involved. Besides those, the package also permits the end user to print or display various type of outputs and they are menu driven.
Keyword: network analysis, activity scheduling, CPM (Critical Path Method), cost analysis.)

Introduction

A project may be defined as an activity which has a distinct recognisable beginning and ending. Project management is the process by which the objectives of a project are planned, executed and controlled for an optimum achievement.

Network Analysis For Activity Scheduling

Network analysis is one of the effective techniques used for planning tasks in a project. It reduces the examination of a project to three stages [1];

i) Breaking down the project into a set of individual activities or events, and arranging them into a logical network diagram according to its technological order,
ii) Estimating the duration and resource requirements of each activity, deducing a schedule and finding which activities control the completion of a project, especially the critical activities,
iii) Reallocating money and/or other resources to improve the schedule.

The term 'Network Analysis', used above is to describe the scheduling methods, such PERT (Project Evaluation and Review Technique), CPM (Critical Path Method) and other similar methods or combination of its.

In the designed package, CPM is chosen for the following reasons;

i) Network is built from activities, which are arranged in their logical order and in sequence. The network of the project activities is more precise, easy to understand and comprehensive,
ii) No allowance is made for uncertainty in the estimates of the duration. Only a single estimate is used of each activity. In this way, the project planner is much confident of their estimates, and make easier to understand and implements on the designed package.

Cost Analysis And Control

In project management, cost analysis and control is carried out in order to meet the target budget and getting a maximum return on investment. Since all project activities are involved with money, it need an efficient method to calculate all the associated costs and a systematic control system.

Normally, the costs of a project can be classified into two categories;

a) Direct Cost

The costs that are directly involved in the activities of a project. For example manpower, materials, machinery and other costs that may be attributed directly to the performance of an activity.

b) Indirect Cost

The cost items not included in the direct cost category, will be categorized as the indirect costs. These costs are proportional to project duration, the longer the duration the more it will cost. For example office rents and its equipments cost, insurance cost, bank's interest, administrative salary and so on.

The total cost of a project is the sum of the direct cost and indirect costs. All the resource and activity costs involved in a project is commonly measured in money'. So, whatever the project control is, the main objective is to get the maximum return on investment.

In any construction project, the objective of speed, economy, quality and goodwill are important. Although planning is essential to management, the implementation and control of a plan is far more difficult and demand management skills [2]. There are many complex factors and events that affect the execution of a project plan. Consequently, control is required to ensure that,

a) the proper resources which include materials, equipments and labour are available at the right time and the right place,
b) resources are used effectively and efficiently,
c) the relevant field decision makers and supervisors are properly briefed on what is needed to be done,
d) the resulting work outputs meet all contractual and quality control requirements.

Once a project has been planned, it is a management responsibility to control its progress and costs in such a manner that the project objectives are attained [3]. This can be achieved by monitoring the progress and expenditures, then comparing them with the planned ones. And if necessary, corrective actions must be taken. Decision has to be made faster and without any delay.

Most important, management needs timely information on project status, which enables it to complete the project within the original estimated costs. Measurement of the actual achievement is done through progress reports and its comparison with the objectives [4]. If the output of progress works do not conform with the planned objectives, either the input must be manipulated or the project plan must be modified. Thus the control of a project requires not only keeping the performance in accordance with the plan, but also keeping the plan up to date.

In the designed package, the control elements and performance to be involved are the following;

a) schedule of project activities,
b) project resources cost,
c) progress reports.

The above elements are mutually interrelated through the project control functions found in the designed package. Each element of the project control must be monitored by the project manager or whoever is responsible for it. He must have adequate feedback information on the project so that the corrective action can be taken when and where it is needed.

Project contruction performance depends on the success of management and the integration of four basic resource ingredients; money, manpower, materials and equipment. The deficiency in any of the above ingredients at any stage of the construction will adversely affect construction progress, cost and its quality.

For effective control, the information flow and status measurements should be regular, accurate and with minimal time delay. The information transmitted through such a reporting system should be accurate, complete and comprehensive.

When the progress information has been collected and processed, it is necessary to compare it with the planned schedule and budgets. However, for a clear understanding of any occurrence of delays on an activity or cost overruns, an update has to be performed.

Updating is carried out to accommodate configuration changes, to assign a new target date and comments. And also to reflect remedial action designed to correct deviations in order to predict their effects. Remedial action is necessary to speed up certain activities if it is crucial to meet the target date. The frequency of updating depends on the project type and its total duration, it may be day-to-day, weekly or monthly.

There is always a danger of trying to advice perfection in schedule, and of over control in consequence. From studies of control in other situations, we have come to know that excessive control may ultimately leave the situation worse than it was to begin with. Any departures from the schedule must be accessed for their significance, that is, whether they are big enough to warrant an adjustment or not.

Designed System

The designed package make use of dBase III software facilities and its relational database structure. The database files of the designed package are briefly described below.

a) Project file

This file holds key information of the project, such as project code, schedule start date and project cost. The record key used is the project code.

b) Activity file

This file holds all the information of all activities which constitute a project. Each record of this file correspond to a particular activity data. The record key is the activity code, the combination of preceding and succeeding

event numbers. In this file, it contains compulsory basic input data and optional fields. For example, for time scheduling, the compulsory data are;

i) Activity code,
ii) Activity estimate duration,
iii) Activity type.

Whereas other fields are optional, depending on the user requirements, for example resource types and its amount. In the designed package, all activities are assumed to be started on normal workday, for example it cannot starts on 'Sunday' or on holiday. However, every particular activity can ends up according to the following type;

i) Activity type = '1'
This activity cannot proceeds on 'Sunday' and holidays,
ii) Activity type = '2'
This activity cannot proceeds on 'Sunday' only,
iii) Activity type = '3'
This activity cannot proceeds on holidays only,
iv) Activity type = '4'
This activity is non-stop, that is when it starts it must finish as early as possible.

c) Resource file

This file holds all the information on the type of resources to be used in the projects, its amount, actual usage and their associated costs. The record key for this file is the resource code.

In the designed package, the resources are divided into two types;

i) Resource type = '1'

This type of resources are not recoverable, that is it is an activity-used resources. For example, most of the material resources such as cement, steel bar, sand and so on,

ii) Resource type = '2'

This type of resources are recoverable, that is it can be used again when the present activity is completed. For example, manpower and machinery.

d) Calendar file

This file holds the information of all holiday dates and its description. It will act as a table look-up.

The designed system was structured into the modular form. Its hierarchy diagram is shown as in Figure 4.1.

Conclusion

The designed package is more general and covered most of the important elements of the management functions such as scheduling of project's activities and calculation of resource costs. With the information provided by the package, it enables the management team to investigate the effects of possible improvements in the project plan, to determine where special efforts should be expanded to stay on schedule, and to assess the impact of schedule slippages.

Further progress towards realism could be made by taking into consideration the resource allocation analysis, though we have not pursued it in this package.

References

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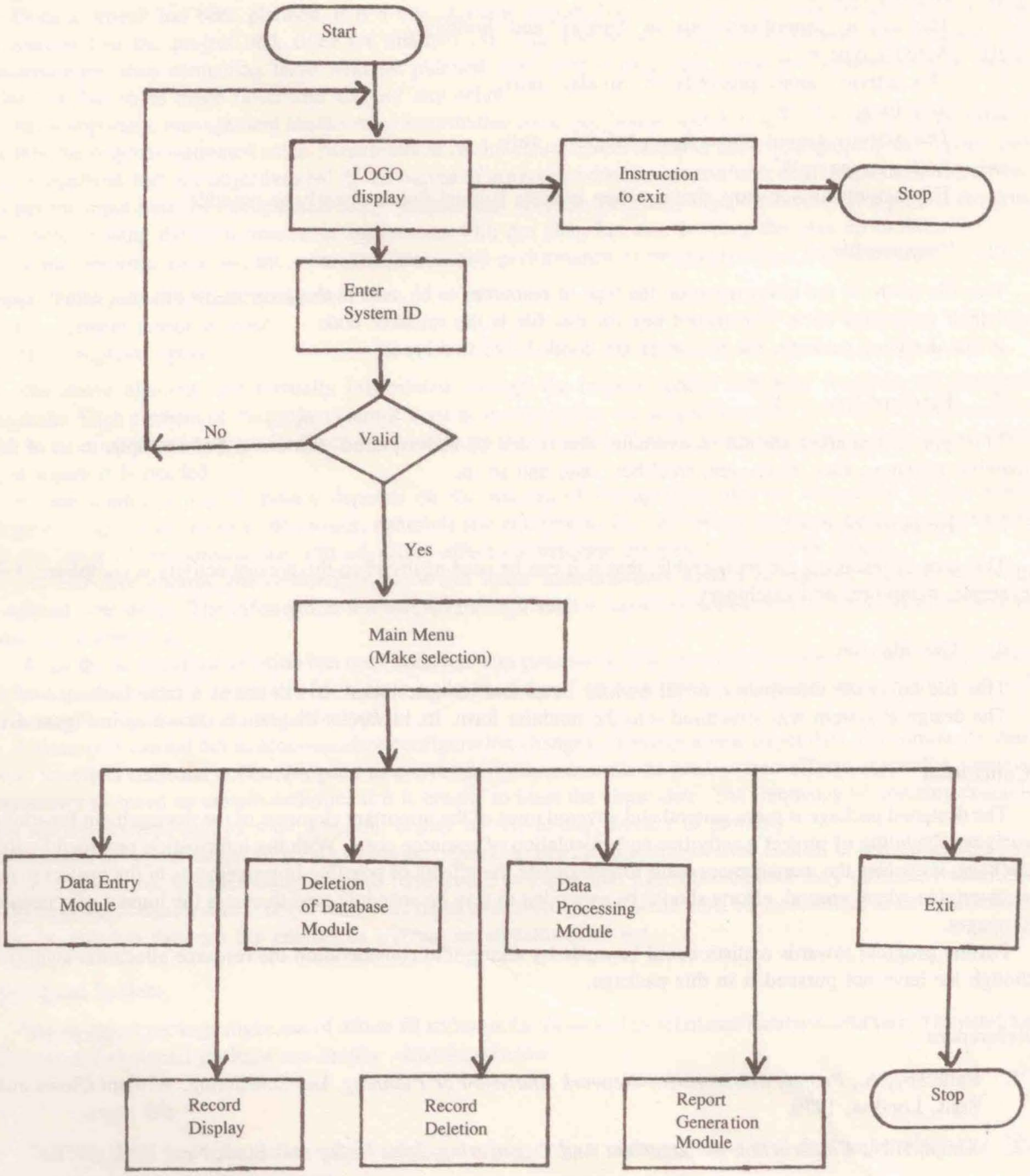

Figure 4.1 General flowchart of the system.