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An analysis on importance of identifying time estimates in projects

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ABSTRACT

Time management is an important issue to consider while developing a project plan. Accurately assessing the time required to complete activities and the entire project is inextricably linked to how resources are used and exploited, which influences financial expenditures. The suggested study seeks to assess the significance of recognizing time estimations for projects. A survey of the existing literature reveals that this aspect of project management has been studied in a variety of scholarly domains, emphasizing its practical value. Investigations into the key causes of project failures reveal concerns such as insufficient emphasis on time forecasts. A descriptive study methodology will be used to highlight the importance of recognizing these time estimates.

KEYWORDS: project management, time estimates, Gantt chart, CPM, PERT.

1. INTRODUCTION

According to estimates, 90% of projects are not completed on time. The work breakdown structure (WBS) is the planning data from which activities are recognized and time is assessed using various methodologies. The most prevalent approaches for scheduling project work are Gantt charts and network diagrams. Gantt charts are often suitable for simple projects and, due to their simplicity, are user-friendly. A network diagram is used to represent the project's activity. It follows a specific course from beginning to conclusion and left to right. Common representative symbols are a square or circle for a node and an arrow to indicate the sequence. The network convention may be AoA or AoN, depending on the project sponsor's policies and the team's needs. The disadvantage of a Gantt chart is that it cannot demonstrate the interrelationships of activities and must be constantly updated. A project can have numerous pathways, but the longest one is termed the crucial. The path is shown by a thick line on the graph. Critical path activities typically do not have spare time. [1]

Common computer-adaptable approaches for creating network diagrams include CPM and PERT. CPM is typically utilized for smaller and less involved projects, such as building construction, and uses a single time estimation that is generally deterministic. PERT, on the other hand, is utilized for complicated projects and includes three probabilistic time estimations. Slack is the amount of time that an activity can take to complete before becoming crucial or delaying the project's completion.

A project may require completion within a specific timeframe, and the project manager can utilize crashing if the indirect costs exceed the direct costs of crashing. The likelihood of a path is based on the standard deviation of the activities, while the project's probability is the dot product of the path probabilities. Understanding the standard deviation of the path, which combines the standard deviations of the activities and the path mean, allows a project leader to determine the likelihood of completing a project within a specified timeframe. The emergence of computer and internet technology has led to the incorporation of software programs in project management.

A key aspect of a project plan is to finish it on schedule. Thus, assessing the resource needs for every task and transferring this data to develop a project plan is the initial successful step. Estimating time is crucial to establishing target start and end dates for the project. With the estimates of resource requirements, time estimates can be allocated to every activity. A preliminary schedule can be created using a Gantt chart, CRM, or PERT network diagram based on this. [2]

To depict and organize project plans, the most frequently utilized methods are Gantt charts or network diagrams. In a network diagram, there are the Program Evaluation and Review Technique (PERT) or Critical Path Method (CPM). The main distinction is that the Gantt chart is straightforward, yet it possesses inherent limitations. As demonstrated in the previous chapter, CPM is typically applied to extensive construction projects and serves as a one-time estimation. Conversely, PERT employs three-time assessments to determine the most likely duration required for software-related projects.

Aim

The goal of this research paper is to examine the significance of recognizing time estimates in Project management.

Approach

Descriptive Research: Descriptive Research has been utilized to examine the different aspects of human participation in the planning and implementation of projects. Here, the traits of time fundamentals are recognized and examined from the perspective of project management. In descriptive research, the process does not address questions about how/why/when the traits emerged but outlines the attributes of the system being examined.

Examination

Henry Gantt was one of the few to acknowledge the significance of non-monetary incentives for employees when FW Taylor's scientific management concept gained widespread acceptance in the industry. He created a system for organizing work schedules. These are visual tools for the employees and supervisors. Similar to the fundamental seven tools in product quality management, they are straightforward and can be comprehended with minimal or no education required. These charts can be utilized in various settings, whether for a classroom, a hospital, or a hotel. This chart's purpose is to visually represent the planned utilization of resources within a specified timeframe. Representing time on the x-axis and activities on the y-axis allows for a visual display that clearly shows activity time and idle time at a glance. From this, managers are given a chance to utilize these charts for the practical development of final resource allocation through trial-and-error scheduling methods. With the presence of productive and unproductive periods, the administration of resources would become more evident. Various types of Gantt charts are utilized, with load charts and schedule charts being the most prevalent.

The load chart displays the activity duration of work centres, indicating when a specific job begins or ends, as well as where idle time is anticipated. Two methods are employed for loading work centres: infinite loading and finite loading. In infinite loading, the capacity of work centres is not considered, leading to potential queuing at some work centres. Therefore, managers continuously seek out idle periods to assign tasks to those work centres or in specific instances of contractual labour. In finite loading, the capacity of the work centre is considered, and jobs are allocated based on their processing times and the available capacity. In these situations, a work centre’s capacity is not surpassed, preventing queuing or bottlenecks. However, there would be a need for continuous updates due to the possibility that the timelines might shift because of new priority assignments. There are two types of scheduling: forward scheduling and backward scheduling. The former involves planning ahead, while the latter focuses on planning backward from a completion deadline. If the inquiry is about 'when will the job be finished,' the manager should opt for forward scheduling; however, if the question pertains to the latest time to start a job, then backward scheduling is implemented. In schedule charts, time is shown on the x-axis while activity is displayed on the y-axis. [3]

Gantt charts are often utilized, but they come with a significant downside that the chart requires frequent updates. These charts might not disclose financial elements or alternative strategies due to the limited details provided. If the job processing times differ based on the work centre, the Gantt chart would not effectively depict the workflow or assess alternative schedules. Gantt charts are a favoured tool for straightforward projects. In this instance, the manager engages in thorough project planning and charts the schedule. Upon the start of the project execution, he evaluates the intended progress against the real advancement. In a Gantt chart for a project, each activity is depicted as a horizontal bar, with the length of the bar reflecting the time frame for completing the activity. A comprehensive Gantt chart can be intricate for a major project; however, the manager can tackle this issue by merging activities into one unified task. [4]

2. NETWORK DIAGRAM

A crucial element to consider in project management is the time schedule. It is a challenging job and, due to its unclear nature, likely to have errors. Many of the projects possess intrinsic complexity and unpredictability. The

greater the project, the more complexity and ambiguity rise. Once the WBS is created, the subsequent step is to establish the time required for each task. The network diagram is employed to ascertain the length of time involved. A network diagram for project tasks could typically be created if there is a clear direction for the project, meaning there must be a specific starting activity and an endpoint. The tasks that advance the project from the initial or starting phase to the completion must be in order and adhere to a specific route. A network diagram is an essential depiction of the activities within a project. By depiction the connections between the tasks are illustrated. They are numbered in sequence, and the task order is demonstrated by pointing out the predecessor and successor tasks. A defining characteristic that sets a network diagram apart from a Gantt chart is this feature. This illustration assists the project leader in overseeing the project tasks. Therefore, network diagramming is an essential method for scheduling critical paths to manage resources effectively. Critical path scheduling involves determining the longest sequence for finishing a project task, with its sequence and duration directly influencing the project's completion time.

Creating a network diagram is an organized procedure. Initially, from the WBS, determine the tasks necessary to finish the project. From this stage move forward to analyse the framework for determining the list of completed activities. Subsequently, create a sequence and comprehend how the activities are interconnected. Determine the initial task and the concluding task. Having pinpointed up to this point focuses on every task and determines the direct preceding and following activity. Determine the anticipated duration for each activity shown in the networking diagram. Assess the projected duration needed for every task and utilize either the forward pass or backward pass to establish the starting time. Consider the slack time. Slack is the allowable deviation from the critical path. Determine the standard that is adhered to by the organization or the project sponsor. Position the tasks and then illustrate the nodes in the network diagram. Assign a number to the node in sequence. Link the node using arrows according to their dependencies. It would be simple to grasp if the arrow's length matched a scale representing the time period. A path is defined as a series of actions from the starting node to the end node. In a specific project, there would be multiple routes. Paths expose the ordered connections among the activities. [5]

The path length can be determined by adding together the expected durations of tasks along that route. The time for paths assigned to each project will differ based on the sequencing of activities in various ways and combinations; however, the project completion time is regarded as that of the longest path. Thus, if there are setbacks in the tasks along the longest path, the entire project is inevitably delayed. Thus, the longest route is referred to as the critical path, and the sequence of tasks forming a chain within the critical path is known as critical activities. This suggests that other routes in a project network diagram are likely shorter than the critical path, meaning these routes might experience delays without impacting the total completion time, provided the delays do not surpass the duration of the critical path. Any such

The difference between paths in a network diagram and the critical path is referred to as slack or permissible slippage.

Findings

While these distinctions can be effectively utilized according to the organization's protocol, it is crucial not to confuse the two when employing network diagrams for a project. As demonstrated, the Work Breakdown Structure (WBS) highlights the key elements necessary for project execution, developing schedules that minimize errors for optimal resource use and estimating completion times that enhance the project's quality. Time estimation begins with assigning durations for each task within the network or WBS, enabling the project manager to establish target start and end dates from the overall project perspective. If the intention is to implement network scheduling, it is preferable to initiate from the initial schedule rather than transition from a Gantt chart to networking at a later stage. Although a Gantt chart may suffice for smaller projects, larger projects certainly benefit from networking. In some intricate projects, a blend of Gantt charts and networking is often employed. Common methodologies that are easily incorporated into project management software available today include the Program Review Evaluation Technique (PERT) and the Critical Path Method (CPM). PERT is particularly beneficial for software-driven projects, employing three-time estimates, while CPM typically relies on a single time estimate, making it more prevalent in construction projects. PERT is essentially a more generalized version of CPM, based on the realistic assumption that precise time estimates are difficult to determine.

There are specific steps that make CPM analysis fool proof. After identifying the activities from the Work Breakdown Structure (WBS) and understanding the relationships between these activities within the overall project framework, create a graphic overview that illustrates these relationships, including all necessary activities. This step will help identify the events that signify the beginning and end of each activity. By understanding these interrelationships, the network diagram will show a continuous flow from start to finish. In these examples, circles represent nodes, and arrows indicate the sequence of activities; these symbols are widely used around the world. Squares can also be used for nodes if preferred. Activities can be displayed as they are in the graphical representation, or for simplicity and to avoid cluttering the diagram, codes can be assigned to activities, which can then be shown as a legend in the network diagram. After conducting a deterministic time analysis, where each activity has been thoroughly examined, the timings are interrelated to determine the path timings and the overall project completion timings. Each path may vary depending on the number and types of activities included, but all paths originate from a defined 'start' and 'end' upon successful project closure. It is possible that, due to the rapid advancement of technology, post-closure activities such as training, commissioning, and maintenance may be necessary for a period of time. This may involve a small team from the existing project team or a group of specialists whose dedicated role is training, commissioning, and providing maintenance during the contract period. During this phase, understanding critical timings and activities will become essential. [6]

Slack refers to the allowable slippage for an activity's completion before it becomes critical or delays the overall project. It represents the maximum delay that can be imposed on an activity without compromising the project's completion within the specified time. However, unforeseen events may arise that interfere with the project, or the project sponsor's requirements may change, creating a new timeline or providing incentives for early completion. In such cases, slippage can be viewed as an opportunity for the project team. To construct a CPM (Critical Path Method) network diagram, essential details required include activities, their interrelationships, precedence, and estimated durations for each activity. The outcome of a CPM network diagram includes the estimated duration of the project, identification of critical activities, and the available slack for each activity. Some useful tips for estimating time are: 1. Assign the time estimation task to an experienced individual. 2. Avoid the tendency to be overly pessimistic. 3. Consider the resources available for executing the project. 4. Be aware of uncertainties arising from team knowledge, skill levels, and teamwork challenges. With the increase in computing capabilities through processors, it is now possible to undertake computer scheduling of activities within a network. Software such as P3, Sure Task, CA-Super Project, and MS Project utilize CPM for scheduling project durations. These packages, with Gantt charts as the default, operate in a user-friendly manner and allow for viewing as activity and resource calendars or spreadsheets. The first step in these methods is to specify a basic calendar indicating the days when tasks can be performed and when resources are available. Following this, establish start and finish dates for the project. Input activities into the schedule derived from the Work Breakdown Structure (WBS) and then collapse the schedule. Link these schedules and create a circular judgment within a set of activities, during which lag and lead times can be incorporated. For computation purposes, further refinement by removing loops is necessary. After this, create a baseline schedule. Within the activity bar, a progress bar and general activity status will be displayed. After inputting the schedule, choose the Gantt view or Gantt chart wizard to calculate CPM. From the drop-down menu, click on ‘Project’, select ‘Filtered For’, then proceed to ‘Show Critical’. To verify that all paths are displayed, return to ‘Filtered For’ and select ‘All’. [7]

when real timings are problem to versions, the estimates are probabilistic, which incorporates an extent of probable variants. As an end result, those conditions necessitate a probabilistic technique. Such a method entails 3 time estimates for every interest instead of the only one used for CPM. These are optimistic (to) time, pessimistic (tp) time, and most possibly(tm) time. Whilst situations are beneficial, the period to finish each pastime computed is referred to as positive time, in case for the equal pastime time is worked out beneath hard situations it's far called as pessimistic time and the most in all likelihood length of time is known as maximum likely time which may be determined out the usage of judgmental or Delphi methods. [8] The PERT chart encompasses a series of duties (activity) and activities. The opportunity that the route could be completed at a given time can be determined by way of the system;

$$z = specified\ time - path\ mean / path\ standard\ deviation$$

The value ‘z’ shows the wide variety of deviations the given direction is beyond a certain time. The bad fee for the ‘z’ method at a particular time is less than the expected direction duration. For this reason, a high-quality price is right and extra the tremendous value higher it's far. A cost of ‘z’ beyond +three.00 the path possibility is expected to be a hundred%.

To increase the probability so that a project is finished within the specified time or, in the case of a requirement projected by the project sponsor for early completion, then the project leader has the option of crashing a project. It is possible that, as a consequence of crashing, new critical paths are likely to be developed. It would be recommended to crash activities on the critical path because crashing non-critical activities may not be that advantageous to bring down the path timings. An activity on multiple critical paths may be advantageous for crashing. In case there is more than one critical path, then identify the activities on each of these paths which give a better trade off in cost. When two or more critical paths have

Common activities then start crashing the least expensive activity and move forward until the crashing cost is less than the indirect project cost.

3. CONCLUSION

One big thing to think about when making plans is to create a schedule that is both practical and cost-effective. A lot depends on the person funding the project and other requirements from the environment. For instance, a huge event like the Olympics might need to be finished before the rainy season, or a school program has to be ready before classes start. Some tools used for this are Gantt charts and network diagrams. Gantt charts are easy to work with, but they don't show how different tasks are connected. This is a significant issue for projects that take a long time. Network diagrams show how tasks relate to each other over time, which helps avoid constantly needing to change the schedule. The terms used in these diagrams are AoA and AoN. For smaller, simpler projects with set timings, CPM is usually the choice, while for bigger and more complex projects, PERT is used. The chances of a certain route depend on the chances of finishing each task involved. The end of a project is determined by the results of the path's probability. New computer programs like Artemis views, Fast Track Schedule, MS Project, and Oracle Project have been added to help manage projects better.

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