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DEVELOPING ACTIVITY LOGIC
TCM Framework: 7.2 – Schedule Planning and Development

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PURPOSE

This recommended practice is intended to provide a guideline, not establish a standard. This is not a how-to on any particular methodology.

As a recommended practice of AACE International, development of activity logic (also called network logic) in planning and scheduling provides guidelines for the sequencing of activities in a logical way generally before duration estimating can be performed. Logic is generally determined before durations are considered. Logic development methods include precedence diagramming, or arrow diagramming methods. Logic is the set of activities and dependency relationships between them. Logic dictates the planned sequencing of activities. A network diagram is often used to illustrate the logic.

Planning and scheduling are not the same. Planning is determining how the work will be done, while scheduling is the analysis and calculation of start and finish dates.

Logic enables the combination of activities to be arranged in one of the aforementioned formats so that a completion date can be established. Logic also enables backward passes to arrive at optimal overall schedule duration.

This recommended practice is for use by project team members involved in planning process, a continuation of activity identification process (reference TCM Framework section 7.2). As in identification of activities, many individuals contribute to the development of activity logic. Having an experienced planner coordinate the process improves final quality, and adds value to the planning process.

RECOMMENDED PRACTICE

Who Develops Logic

Better planning results from the involvement of key team members facilitated by the project planner. For example, on a large construction project key members involved in this process might include a project manager, construction manager, estimator, procurement manager, design manager, owner representative, operations representative, and scheduler.

A planner has strong working knowledge of how the work is performed (i.e., how the activities inter-relate). A scheduler takes the plan, and performs analytical functions to create the actual project schedule such as estimation of time durations. One individual may serve as both the planner and scheduler, or at other times may be different people.

A team meeting or workshop is an excellent means to develop activity logic. This may be combined with the workshop to identify activities.

When Should You Develop Logic

Logic development is an iterative planning process. Initial logic development is begun after identification of activities, and before the scheduling process step occurs. This process is further refined during schedule development and optimization.

How To Develop Logic

Generally, logic development starts with an activity list. Related business and project requirements must also be considered such as project specific logic constraints. Other useful information for logic development includes pre-existing logic templates, and historical references such as past project plans, schedules, or parts thereof.

One method often used at the beginning of logic development is to write each activity on a separate card, and place them on a wall. In a team process, the cards can be arranged to create a basic sequencing of activities. Some sequencing is obvious such as forming before placing concrete. Other relationships require flexibility and creativity in achieving planned objectives. Some activities may be concurrent, while others may be sequential. This needs to be done in consideration of the dependency relationships described below. Once set, the activity sequence information may be entered into a scheduling software application

What Are the Logic Relationships

Each activity has a start and a finish. A single logic relationship describes the interdependency of starts and finishes between two activities. There are four possible relationships between an activity's start and finish, and those of other activities.

The most commonly used relationship between two activities is finish-to-start (FS), wherein the first activity must finish before the second activity can start. A second type is finish-to-finish (FF), where two activities must complete at the same time. The third type is start-to-start (SS), where two activities start at the same time (regardless of their finish dates). The fourth is start-to-finish (SF), where an activity must start before a second activity can finish.

Additionally, lag time can be applied to all four relationship types. Lags are timing applied to logic; they consume time, but are not activities per se. For example, lags can be used to define that footing formwork needs to remain in place until concrete is properly cured.

Activities can be linked with hard logic (i.e., sequence of each activity is predetermined, such as footing A before footing B), or soft logic wherein related activities may be combined and accomplished in a different order as determined at the time of execution. There are also physical hard logic relationships where soft logic does not normally apply, such as footing formwork must be in place before concrete can be placed.

What Are Logic Diagramming Methods

There are two common diagramming methods. One, precedence diagramming method (PDM), is known as "activities on node." In this method, each activity is represented by a node with connecting lines representing relationships between activities. Each preceding activity (predecessor) controls the start or finish of succeeding activities (successors). The PDM method can use all four-relationship types.

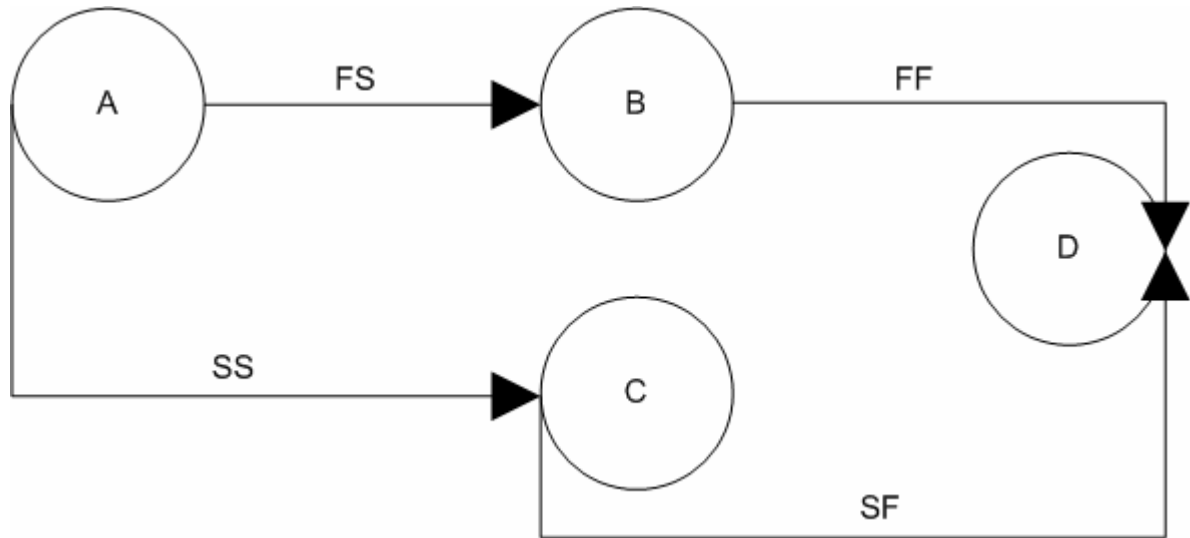


Figure 1. Precedence Diagramming Method (PDM) – “Activity on Node”

The second, arrow diagramming method (ADM), is known as “activity-on-arrow”. In this method, each activity is represented by an arrow between nodes. In this case, the nodes are merely symbols representing connection points. In the ADM method, only finish-start relationships are used.

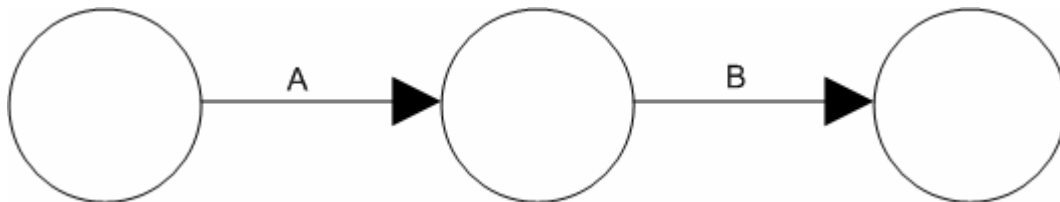


Figure 2. Arrow Diagramming Method (ADM) – “Activity on Arrow”

The PDM method is the most commonly used because it provides greater flexibility due to the availability of more relationship types.

Before beginning schedule analysis, the logic network diagram should have a single start node or point, and a single finish point or node. Every activity between the overall start and finish must have both a start and a finish relationship.

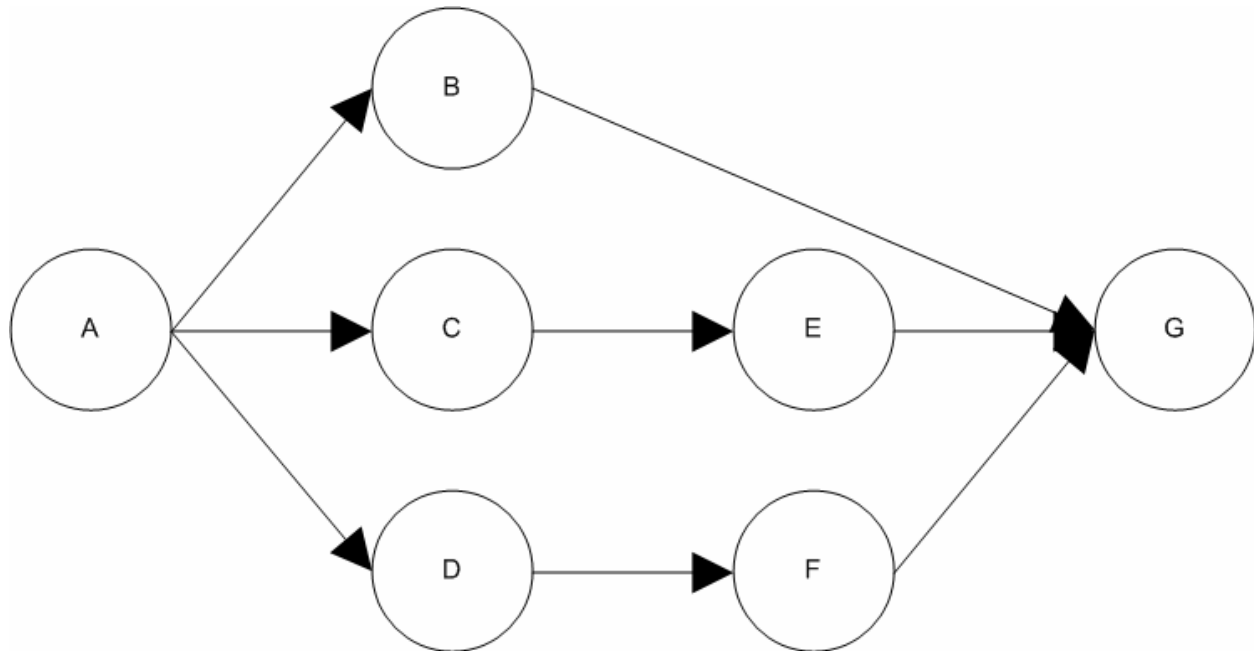


Figure 3. Precedence Diagramming

What's Next

Development of activity logic is a pure planning step where relationships are established regardless of the dates on which activities fall. The next step in the planning and scheduling process is to consider other factors such as time, resources, and milestones to achieve project objectives.

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