Task dependency – critical path

Technology

Dependencies and Network Diagram The network diagram is a schematic representation showing the sequence and relationship/ dependency of the tasks along with their duration. All the tasks, except the first and the last, are linked with at least one predecessor and successor to have a proper sequence of work. This logical dependency between the tasks will determine afterwards the duration of the project.

There are four types of dependencies which define the relation between pair tasks Finish-to-start (FS- the second task ‘ successor’ can’t begin until the first ’predecessor’ is completed), Finish-to-finish (FF- the completion of the successor depends on the completion of its predecessor), Start-to-start (SS- the start of the successor depends on the start of its predecessor), Start-to-finish (SF- the finish of the successor depends on the start of its predecessor). Critical Path

However the duration of the project is meaningless without identifying what is driving the project, why the project takes so long, what possible action is required to shorten the duration or what possible risk may extend the project... Among the set of activities interconnected on the diagram; there is always one longest duration path from start to end of the project travelling through the network, Carmichael D. (2006, p. 51). This longest path is also known as a critical path driving the project duration and all tasks falling on this path are called critical activities.

Any delay which occurs on these critical activities will delay the project completion time as well. The critical path analysis is carried out in three steps. The first step consists of forward pass which calculates the early schedule (earliest start time and earliest finish time of a task). If a schedule

activity has two or more predecessors, its early start is governed by the early finish time of the preceding activities whichever is maximum. The second step is the backward pass which calculates the late schedule (latest start and latest finish time of a task).

If a schedule activity has one or more successor, its late finish is governed by the late start time of the succeeding activities whichever is minimum. Finally the third step calculates the total float and free float. It is therefore crucial to have dependency between pair of tasks in order to analyze the duration, critical path and critical activities of the project. Critical path helps the project team to complete the project efficiently and on time. Nonetheless critical path is dynamic in nature and changes depending on the progress of work, Furniss B. nd Trauner J. (2010). Constraints Wysocki (2012, pp. 205-209) explains that there are four types of constraints which each one has appropriate area of application 1- Technical constraint This is a dependency in which the successor activity can start with some output of the predecessor activity. According to Wysocki there are four types of dependencies under this technical constraint • Discretionary constraint This is a judgment which may be introduced by the project manager to change the dependency between tasks and avoid further risk.

Discretionary dependency is often called soft logic, Kerzner H. and Saladis F. (2009, p. 167). • Best-practice constraint This refers to previous experience of the project manager or others in executing similar task to the present. In some circumstance, dependencies which come from past experience are part of risk-aversion. The dependencies vary from industry to industry either

to faster production (SS) or to avoid risk (FS- mostly building construction starts after the design is finished) • Logical constraint

It is a result of the project manger's way of thinking or common sense to follow logical sequence between pair tasks in such a way the logic is reasonable and justifiable. • Unique constraint It occurs usually when a specific/critical resource is required for the execution of several tasks. 2- Management constraint This constraint is imposed by the management and dependencies of tasks can be reversed to a better one should the need arise. 3- Interproject constraint My current project is a construction of student accommodation and has a specific requirement for the toilet to be installed in the student rooms.

This toilet is called prefabricated bathroom POD which should be manufactured as a complete standalone unit with floor and wall tiles, door, shower tray, water closet (WC), bidet, hand wash basin, mirror, hair drier... off-site. The construction of the pods is a separate project. The pods are, then, transported to the site, lifted with crane and installed in the building. The installation of external masonry blockworks on the main project can only start after the delivery and installation of pod is finished (see attached picture). 4- Date constraint

This constraint preset a fixed start or finish date for deliverable to make it happen on a specific date. There are three types of constraints. The first and the most annoying constraint which I exercised on my current project is the ' on this date'. In order to energize all the utility services and proceed with all subsequent testing and commissioning activities, we (the contractor) needed to know when the power supply will be provided/completed by the client. The

client ordered the contractor to submitted programme of work applying a constraint “ on this date” for power-on connection task.

We prepared the programme accordingly and highlighted the client that the project will be completed on X date from the day we receive the power-on. Unfortunately the power-on could not happen on the specified date and ALL of our subsequent activities were affected. The sequence of work was totally distorted with difficulties to construe the schedule resulting negative float. ‘ No later than’ is the second constraint you can impose on a task to limit the latest finish time it can be finished. This constraint can, as well result negative float.

The third constraint is the ‘ No earlier than’ which specifies the earliest date a task can be finished but cannot result negative float by itself. Conclusion In general the combination of different dependencies and constraints build the project schedule and form the network diagram which is a tool to understand the sequence of work and critical activities in the project. Carmichel D. (2006) Project Planning and Control London: Taylor & Francis Furniss, Brian J. and Trauner, Theodore J. (2010) ‘ The Critical Path: Definition vs.

Understanding’, Construct, 19(1), [Online]. Available at: http://ehis. ebscohost. com. ezproxy. liv. ac. uk/eds/detail? sid= 89b2f511-7e34-41db-8676-5d3f40f45afe%40sessionmgr10&vid= 1&hid= 3&bdata= JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#db= a9h&AN= 52161761 (Accessed: 05 October 2012) Wysocki, R. K. (2012) Effective Project Management: traditional, agile, extreme. 6th edn. Indianapolis: John Wiley & Sons, Inc. Kerzner, H. and Saladis F. (2009) Project Management Workbook. 10th edn. New Jersey: John Wiley & Sons, Inc.