



## Paper Tower Competition for Teaching Earned Value Management

### Purpose

The purpose of the exercise is to build a paper tower in accordance with given requirements and to apply Earned Value Management (EVM) for the monitoring and control of execution of the construction project as part of a project management course.

### Goals and objectives

#### Goal

On the cognitive level, the learning objective of the game is to reinforce concepts and to teach the competency to apply the knowledge on earned value management covering the cognitive levels remembering, understanding and application in accordance to the revised version of Bloom's taxonomy of educational objectives (Anderson and Krathwohl, 2001).

#### Objectives

After the session, the participants will be able to calculate and interpret Performance Indexes (Cost and Schedule) to track project progress as part of Earned Value Management.

### Primary target audience

The activity is intended to be used as part of project management courses (either as part of university courses or professional training) targeted to teach project management professionals and students. A pre-requisite for the application of the activity is that the participants have a basic understanding of project management and earned value management taught, e.g., through lectures.

### Group size

Groups are composed of at least 4 participants and with a maximum of 7 participants. Each member of the groups assumes a specific role, including:

- Project manager (1 participant): responsible for completing the project planning and project monitoring and control
- Principal engineer (1 participant): responsible for the design, construction and test of the paper tower.
- Engineers (1-4): participate in the design, construction and test of the paper tower.
- Auditor (1 participant): responsible for controlling the correctness of project monitoring of another group (Observ. This role is included in order to assure the correctness of the register of resource usage and the calculation of EVM indices).

### Duration

Phase	Time
Explanation of the activity	10 min
0. Project planning	15 min
1. Design of the tower	3 min
Monitoring & control	3 min

2. Construction	3 min
Monitoring & control	3 min
3. Construction	3 min
Monitoring & control	3 min
4. Construction and test	3 min
Monitoring & control	3 min
Debriefing	15 min
TOTAL	64 min

### Physical setting

Room size depends on the number of groups providing sufficient space for each group for the construction of the tower. Should be available at least on desk for each group's project manager.

### Materials and equipment

- Slides for the explanation and execution of the activity (including also timers)
- Template for project charter and project plan (one per group)
- Template for documenting the design of the tower (one per group)
- Template for registration of resource usage (one per group)
- Template for performance report (one per group)
- Paper sheets (about 15 sheets per group)
- Paper clips (about 15 per group)
- Tape (one roll per group)
- Scissor (one per group)
- Metric tape (one per group)

### Process

- Objective is to build a paper tower with a height of 60cm using only provided materials. The tower has to stand free of any external support (e.g., cannot be fixed on the floor, wall or a member of the group). The tower also has to resist a light wind (blown by the facilitator).
- Only projects completed on time with the tower fully built according to the requirements will be considered in determining the winner. Projects also need to have properly registered the performance report.
- The criteria used with equal weights to determine the winner are:
  - Largest number of SPI (Schedule Performance Index) and CPI (Cost Performance Index)  $\geq 1$  during the project
  - Minor total project cost
  - Beauty (to be evaluated subjectively through a vote of all participants)

Phase	Description
Explanation of the activity	The facilitator presents and explains the activity and all of its steps.
0. Project planning	Coordinated by the project manager, the groups revise the project charter and the initial project plan. Each group member is assigned to one of the specified roles. Each group estimates resources and completes the cost baseline. The

	groups also analyses potential risks and, if necessary, symbolically acquire protection.
1. Design of the tower	The engineers of each group discuss the design of the tower to be constructed and document the results in form of a schematic drawing. The project manager registers any usage of resources. The auditor (member of a different group) controls the registration (completeness and correctness).
Monitoring & control	Coordinated by the project manager, each group revises the resources used during the design and analyses the progress made. Based on this data, the group calculated the SPI and CPI following Earned Value Management for this phase. The auditor (member of a different group) verifies the correctness of the calculations.
2. Construction	Based on the design of the tower, the engineers start to build the first part of the tower. The project manager acquires any necessary resources and registers the usage. The auditor (member of a different group) controls the registration (completeness and correctness).
Monitoring & control	As above with respect to phase 2.
3. Construction	Proceed as in phase 2, continuing the 2. part of the construction of the tower.
Monitoring & control	As above with respect to phase 3.
4. Construction and test	Proceed, completing of the construction of the tower and testing the tower with respect to the defined requirements.
Monitoring & control	As above with respect to phase 4.
Debriefing	Discuss the importance of Earned Value Management as well as reflection on what the participants learned in this activity.



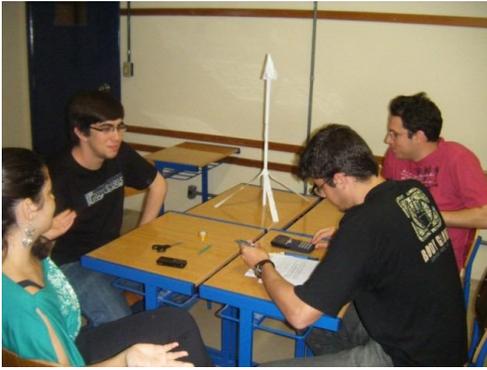


Figure 1. Students of a Project Management Course of the Computer Science Undergraduate Course at the UFSC - Federal University of Santa Catarina/2009.

### Debriefing main points

The debriefing is directed to reflect on the usage of earned value management to track the progress of the project, including discussion questions, such as: What do the performance indices indicate? How did your project perform regarding the performance indices? Why did this happen (e.g., why did you spend more than planned on resources? Why did the execution take longer than planned?

In a second part of the debriefing the objective is to briefly reflect on the activity as a learning opportunity, discussing questions, such as: What did you learn through this activity? How can you apply this in your daily work?

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### References

Anderson LW, Krathwohl DR (eds) (2001) A taxonomy for learning, teaching, and assessing: a revision of bloom's taxonomy of educational objectives. Longman, New York