

# **LEARNING PROJECT MANAGEMENT THROUGH SIMULATION**

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## **ABSTRACT**

Through a simulation, one can enhance student learning of valuable business management skills while providing an enjoyable experience. Specifically, integrating a simulation into an undergraduate project management course is challenging and requires an innovative approach. Both information regarding the details of how a simulation was actually incorporated into a course and subsequent student comments are presented in this paper. Competition among students for best performance gave excitement to the learning process.

## **INTRODUCTION**

In the fast-paced, competitive environment of business today, time and cost are critical resources within any organization. The business graduate who understands how to use both of these effectively and efficiently has an obvious advantage. The project management simulation game presented in this paper is a practical, “hands-on” educational pedagogy for the student to learn how to make decisions regarding the allocation of human resources in the management of time and cost for a project. Coping with uncertainty during the course of the project is also a benefit of the simulation game since changes are announced as the game progresses. This element of uncertainty simulates real world situations that occur in a business project. It prepares students to enter the job market and ultimately the workplace with valuable experience in project management skills.

## **PROJECT MANAGEMENT SIMULATION**

Numerous businesses are involved in the management of projects on a day-to-day basis. The preparation of students for this environment is essential. This paper focuses on the experience gained by business students in playing a game designed for learning project management skills. Specifically, the game gives students the opportunity to manage the actual time and cost for a project by requiring them to make “real” life decisions and then to see the effects of those decisions on the project. Overall, the student develops conceptual and critical thinking skills. The game allows students to visualize the project as a whole and places them in the actual role of project manager. Business concepts and facts learned in the course gain relevance and challenge students in their application while participating in the game.

The project management simulation game used for the course was developed for educational purposes by Ken Klassen and Keith Willoughby [1]. It was one of the resources available from the project

management book by Pinto [2]. It can be used as a stand-alone project management learning exercise. Before beginning the simulation, students needed to formulate an initial strategy for the project. Information showing the various project activities, immediate predecessors, and duration of each activity for accomplishing the project were provided for students. With this information, students completed the network diagram and identified the critical path, i.e. longest one through the network. Once this was done, the instructor verified that the student's network was correct. Then the student allocated resources to tasks for each weekly round of the project. The goals of the simulation were to complete it in as few weeks as possible and to do this at minimum cost.

Because the simulation also teaches the student about uncertainty, a decision making condition that is common for managers, success required that the student think ahead about what things may happen during a project and how to manage these uncertainties if or when they happen. Specifically, the critical path was increased in length over the project life while the time for the total project completion was shortened. Coping with this reality presented a particular challenge for students because the critical path determines the earliest a project can be accomplished. This path can only be shortened if the activities are "crashed," i.e. apply extra resources to the activities on the critical path. To succeed in the simulation, a student needed to recognize this fact in the early weeks of the project.

### **SIMULATION EXERCISE CONDITIONS**

There were constraints given in the simulation for its play. Major ones stated that a maximum of two workers could be assigned to any given activity and that no more than five workers could be assigned overall per week. The normal allocation per week for workers was four. A cost was associated with each worker used, and a premium was charged if the one additional worker that was available each week was used. Additionally a surcharge was levied if two workers were assigned to an activity to cover the coordination and/or overtime required. Initially the completion deadline for the project was to be ten weeks with a penalty charged for each week that the project exceeded the deadline. In order to simulate uncertainty as previously stated, changes in time for various activities were announced as the game progressed. Also, the completion deadline for the project was decreased from ten to nine weeks after the fifth week of the simulation. Student decisions for allocation of workers per week were recorded in an Excel spreadsheet that automatically calculated cost.

### **OUTCOMES**

Upon completion of the simulation, each student was required to write a paper about his or her experience, including a summary of the simulation, discussion of their decisions during the simulation, and what he or she may have done differently in retrospect. This reflective exercise after the completion of the simulation provided the student with an invaluable learning opportunity as it exposed the wisdom of his or her prior decisions. In context, if a student did not realize or account for the critical path increasing during the simulation and then suddenly the project length was decreased, this could potentially cause major problems in the completion of the project on time and on budget. By reflecting upon past decisions, it is hoped that the student would now realize, if he or she had not already done so, that distributing resources among activities in a balanced fashion was necessary to finish the project successfully.

Additionally, included in the student's reflective paper was a section pertaining to what the student learned by participating in the simulation. Some sentences from comments of the students regarding their learning experience are included below:

“The management game assignment to me was very helpful in expanding my knowledge of project management...It brought what was taught through lecture and through Microsoft project together...The fact that the game presented many changes like the ones that we can really face in real-time projects served as a learning experience for me.”

“The game was a valuable learning tool...As a project manager, I need to be conscious to the idea of potential problems being right around the corner.”

“This assignment gave me project management skills I will be able to utilize in real life. I know that no project will be able to be completed without some unexpected challenges being presented. Whether the challenges occur due to human error or not, they still must be assessed and accommodated in a timely and effective manner in order to be able to successfully ensure the completion of the project...I will use this simulation in the future to remember the importance of thorough monitoring and controlling and the effects my follow up can have on my own success as a project manager and a businesswoman.”

“I enjoyed working on the game because it taught me the importance of time management...I have also learned the importance of establishing a budget and staying within that range as you endure the complications throughout the project.”

“In doing this simulation again I would have tried to plan out all my decisions ahead of time and then make changes to my decision as the changes for the game were announced each week...Overall this project gave a good taste of what a project manager needs to think about when scheduling tasks for a certain project, without having to deal with the actual employees. So it let us stick to making the decisions to give us a feel for completing tasks under a deadline and keeping our costs as small as possible.”

“...I learned that there will be things to go wrong when working on a project. Some of these negative events can be miniscule in relative importance...some are very crucial like the time frame of the project being shortened...I learned that completing the project as quickly as possible does not always mean that you have succeeded.”

“If I had the chance to play the project management game again I would have used the extra employee several times in the early weeks to create a buffer by finishing tasks early rather than right on time.”

Overall, these student comments demonstrated the benefits of applied learning from using this project management simulation in an undergraduate project management course.

## CONCLUSION

Knowing the facts about project management requires the next step of how to use those facts for a successful project outcome. Putting project management concepts into practice is complex. Incorporating this simulation into the project management course provided a valuable opportunity for business students to explore the complexity of project management and to learn through experience the following concepts as recognized by Klassen and Willoughby[1]:

- 1) Network Diagram Relationships
- 2) Critical Path and Its Management Throughout a Project
- 3) Time Management of Activities

- 4) Cost Management in Projects
- 5) The Balance and or tradeoff between Time & Cost In  
Managing Any Business Project
- 6) Impact of a Project Deadline & Penalty for Exceeding
- 7) Optimal Use of Limited Resources
- 8) Concept of “Crashing”
- 9) Managing in an Uncertain Environment

Incorporating this simulation in a project management course has provided students with the opportunity to learn in a hands-on, pro-active environment the concepts of project management. It serves as a bridge where business concepts and theory converge with practice.

### **REFERENCES**

1. A Project Management Decision-Making Game (2003) Designed by Ken Klassen, Brock University and Keith Willoughby, Bucknell University.
2. Pinto, J., *Project Management Achieving Competitive Advantage*, 2<sup>nd</sup> Edition, Prentice Hall, Upper Saddle River, New Jersey, 2009.