Using Class Projects in Project Management Education

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Introduction

Project management degree and certificate programs are becoming more plentiful in the academic marketplace as employees of businesses and governments increasingly recognize that specialized skills and approaches are required in order to manage projects effectively in today's fast-paced world. As in any other field of education, students enrolled in project management courses are normally assessed using a variety of grading mechanisms. Typically, some combination of quizzes, exams, papers, discussions, and projects is used to assess performance. This paper discusses the role of class projects in the overall scheme of things, and assesses the value that projects can add to the educational experience.

Major Issues

Many questions arise in the design of class projects for any given course:

1. Will it be an individual or group or group project? If it is to be a group project, then how many students should be in each group and what should be their roles? How should group members be chosen?

2. How should the project topic be chosen? Should the students be left to decide on their own what it is appropriate to do? Should the instructor require a proposal from the team and then negotiate a scope? Or, should the instructor designate the topic and the conditions? If so, how much project information does the instructor provide? Should the project be real-world based, or should it be a fabricated one?

3. Whether individuals or teams are chosen, does each group work on the same project? What would be the advantages and disadvantages of that scheme to both the instructor and the students? In any case, are the different project groups allowed to interact with each other?

4. What aspects of project management should the project cover? Should links to *PMBOK® Guide* be clearly established? 5. How should the project be phased? Should it be initiated at the beginning of the course and concluded at the end? Or, should the project be phased strategically to coincide with major aspects of the course? If phased, how should the phases be related?

6. Would both oral and written reports be required? If so, how should those reports be organized?

7. What grading mechanism will be used to assess outcomes? If it is a group project, how will the individual grades be determined? What proportion of the total grade should be represented by the project?

8. What should be the relationship between a project in a given class to projects and other work being undertaken in other classes in the same academic program?

9. What role should the instructor play in the conduct of the project as the class progresses? Does the instructor take an active role in the management and oversight associated with the project (e.g., playing the role of senior management), or does he or she play a passive role (e.g., serving as a PMO-type sounding board)?

10. What kind of feedback from the students will it be most appropriate to obtain in order to assess the value of the project in their educational programs? How will that feedback be obtained? How will it be evaluated?

In this paper, the project experiences obtained in three Keller Graduate School of Management (KGSM) courses will be used to gain insights into how to address this Top Ten list of questions. The first course is PM586 Project Management Systems taken by all students pursuing the Master of Project Management (MPM) degree, and also by a sizeable number of students in other Keller degree programs who use this course as an elective. The second course is PM587 Advanced Program Management taken only by students pursuing the MPM degree and by some students in the Master of Business Administration (MBA) program who seek a concentration in project management as part of their credentials. The final course is PM600 Project Management Capstone taken as an integrative concluding course by all MPM graduates-it is not available for enrollment by any other students. The projects undertaken in each of these courses differ dramatically in scope, content, and importance.

Course Descriptions

Descriptions of the above courses are contained in the KGSM Academic Catalog 2000-2002, as follows.

PM586 Project Management Systems

Project Management Systems introduces project management principles and methods from the standpoint of the manager who must organize, plan, implement, and control non-routine activities to achieve schedule, budget, and performance objectives. Topics include project life cycles, project selection and organization, as well as planning, budgeting, and scheduling systems. Planning and control methods, such as PERT/CPM, and Gantt charts, earned value techniques, and project audits, are studied. *No prerequisite.*

PM587 Advanced Program Management

Advanced Program Management examines how project managers plan, schedule, and control multi-project programs within an organizational context. Topics include the role of projects in organizations; project management methodologies; program planning and tracking; legal and ethical issues; conflict identification and resolution; project team management and leadership; alternative organizational systems; and advanced application of project management software. *Prerequisite: PM586*.

PM600 Project Management Capstone

Project Management Capstone provides students with the opportunity to integrate knowledge and skills learned throughout the program, and is intended to be taken as the last course. Students develop, design, and present a project; plan and justify the project; work to satisfy performance, schedule, and budget requirements; adjust for unplanned occurrences; and provide status reports. *Prerequisite: Successful completion of all MPM management core and program-specific courses.*

Course Project Components

The KGSM philosophy is that student performance in non-capstone courses should be based on a variety of learning experiences rather than only one or a few. For that reason, courses other than capstone courses will embody some combination of quizzes, exams, problem assignments, research papers, and projects. Not surprisingly, in project management courses, the project component is accorded a relatively high weight as compared to the weight given to projects in the other five major KGSM degree programs.

PM586 Project Management Systems

The project undertaken in this course is worth 20% of the overall grade and is performed on an individual basis. All students work on the same project. Currently, the project is conducted in two parts that, overall, mirror the typical project life cycle. In the first part, due on or about the middle of the term, students receive verbal descriptions of a situation in which a company is about to make a decision on which of two projects to pursue in the next fiscal year. Information on company priorities is provided to the students, and various characteristics of the two projects in question are made available. The characteristics provided are both qualitative and quantitative, and include some financials. It is important to note that the information provided is of sufficient ambiguity to ensure that there is not a clear-cut answer as to which project the company would necessarily prefer. Considerable judgment is required of each student with respect to how he or she processes the information that is provided. The outputs expected in this part of the project are (a) selection of a project with appropriate rationale, and (b) a Work Breakdown Structure (WBS) that depicts the hierarchy of work packages that would be expected in order to complete the project of choice. Importantly, while the information presented will usually lead most students to selecting one of the projects (call it Project 1) over the other (call it Project 2), those who choose Project 2 over Project 1 are not downgraded as long as their conclusions are supported by rationales that are consistent with the assumptions being made.

The second part of the project is turned in at the end of the term. After the instructor has graded the first part of the project, specifications for the second part are handed out to the students. Those specifications require that the student develop a budget and a schedule for the project that has been selected by the instructor (not surprisingly, this is the project that most students have chosen in the first place), and then use project management software (currently MS Project 2000) to resolve some difficulties that arise when the project components are put together. Specifically, with the information given, the project cannot be completed by the deadline established by senior management, and one of the major resources used in the project is over-allocated. Each student is expected to "invent" ways of resolving these difficulties, and then calculate earned value information as of a given date during which the project is in progress. A status report as of that date is required.

Oral reports are not required in the PM586 term project(s). The instructor's relatively passive role throughout is merely to answer questions of clarity and serve as a sounding board for student questions and concerns.

PM587 Advanced Program Management

The project component of this more advanced course is accorded a weight of up to 40% of the overall grade. We recognize that in the increasingly sophisticated employment environment, team skills are more important than ever. More than ever before, organizations are finding themselves in situations where medium-scale or large-scale projects can only be completed by effectively organized and managed teams. For this reason, strengthening student's team building and team leadership skills are major objectives of this course. Teams with three or four members are employed; four is the preferred team size because it has a larger number of communication channels, presents the most opportunity for conflict, and presents a greater challenge in attempting to control "free riders."

The objective of the project is for the team to create a project for developing a commercial high-rise office building with surrounding amenities and facilities. The team is encouraged to use SimTower software to simulate the project so as to establish appropriate building specifications, construction schedule, and investment returns. Following the simulation, the project plan being proposed is developed using standard project management software. To make things more challenging, the "customer" in this case is presumed to be a group of conservative multi-national investors. These investors are assumed to hire the team to prepare a proposal with reference to location in a particular country. Each team would be asked to consider a different country, thus making a particular team's challenge different from the others. Specifications for the building and the amenities also differ with respect to the project teams.

The teams are required to make periodic oral presentations (accompanied by written briefs) to the investment group (instructor), and then to make a final presentation with full written report at the end of the term. All team members are required to participate in the oral presentation. Included as an appendix in the written report is the team's consensus assessment of its own performance, compiled from tracking the process from start to finish with respect to establishing operating rules, assigning responsibilities, participating in team meetings, and so forth. Finally, each team member provides a peer evaluation that assesses quantitatively and qualitatively the contribution of every team member, including his or her own contribution. That peer evaluation serves as a "discriminator" allowing the instructor to provide differential project grades to team members rather than assigning the same grade to everyone regardless of effort.

PM600 Project Management Capstone

This course integrates all of what the MPM student has learned into one complete package. It is fair to say that the entire course consists of the development of a comprehensive project plan, and that 100% of the course grade is determined by performance on that project. At the present time, the course utilizes two-person teams in achieving the course outcomes, although, until very recently, the projects were completed individually.

In an attempt to achieve some consistency across the class in terms of project scope, a student team may choose form one of four preapproved cases or the team may elect to develop its own case, subject to the approval of the instructor. More than 50% of the student teams choose the preapproved cases. These cases are:

Planmore Enterprises

This case involves implementation of a turnkey facility to produce aluminum siding in a continuous painting and drying process. The student team plays the role of being employees of the Bryant Engineering Company, and is assigned project management responsibility for implementing Planmore's continuous aluminum siding line. This includes construction of the building as well as specification, procurement, and installation of production machines and ancillary equipment for the line.

Automotive Parts, Inc.

This case requires automation of production at Automotive Parts, Inc. as part of a cost-reduction effort that is critical to the firm's success as a supplier of small mechanical components. The student team plays the role of being Automotive Parts employees given complete project management responsibility for the undertaking. This includes planning and preparation of a factory for installation of automated machines, procurement and installation of machines, preparation of operational plans, and participation in human resources planning to deal with impacted production employees.

Service Construction, Inc.

This case involves implementation of an enterprise information system for Service Construction, Inc., a small specialty industrial construction firm. Students play the parts of employees of Mainstream Systems Consultants and are assigned project responsibility for implementing the new Service Construction system. This includes system design, procurement of computer hardware and standard software, writing of custom software, system integration, system testing, and customer training.

Universal Advanced Controls, Inc.

This case involves startup of an offshore manufacturing facility for Universal Advanced Controls, Inc., a producer of electronic controls for industrial and consumer products. Students play the roles of employees at Universal Controls and are assigned responsibility for establishing the company's first offshore manufacturing facility. This includes refurbishing an existing factory building, specifying and procuring advanced production equipment, and establishing the production systems and personnel necessary to turn over the project as a ready-to-operate plant.

There are three project-related deliverables expected from each two-person project team:

1. A *preliminary plan* for the team's senior management (oral and written) worth 10% of the final grade

2. A *proposal* for the customer (written only) worth 30% of the final grade

3. A *working project plan* for an independent auditor (oral and written) worth 60% of the final grade.

An unusual twist in this course adding realism to the project experience is the fact that the instructor concocts an "unexpected event" and a scope change that the team needs to deal with in the preparation of its audit report. This information is provided to the teams after the proposal has been submitted and presented orally. That is to say, the ultimate working plan (audit report) is created by starting from the proposal, and then adding working management detail; incorporating functional plans and procedures; replanning for an unexpected event; and accommodating a scope change.

Student teams choosing their own projects follow the same process with an added initial step of having to receive approval for the self-initiated project idea.

Each year, Keller Graduate School of Management gives a Capstone Project Award to the most outstanding project plan produced in the PM600 classes taught at Keller centers nationwide. The award carries with it a small financial stipend provided by Commonwealth Edison.

Assessment

As can be seen, the course structure at KGSM allows for exposure to all elements of project work in the curriculum. The array of project work allows students the opportunity to work on

Table 1

	PM586	PM587	PM600
Team Size	1	3-4	2
Written/Oral	W	W,O	W,O
% Of Grade	20	40	100
Concept Integration	Minimum	Moderate	Maximum
Project Scope	Narrow	Medium	Wide
Instructor Role	Minor	Modest	Major

projects in different fields of business endeavor, and under different rules and constraints. This curriculum has evolved over the last ten years or so, and is felt to be optimal in providing the kinds of project-related experiences that will provide the best mix of capabilities that project managers will be able to bring to their companies as the result of receiving this education.

To summarize the array of options along with important educational and professional training dimensions, consider Table 1.

The above depiction of project work in the three courses discussed (PM586, PM587, and PM600) illustrates how we have addressed most of the Top Ten questions in our curriculum. Two issues remain. The first of these has to do with the extent to which A Guide to the Project Management Body of Knowledge (PMBOK[®] Guide) serves a frame of reference for anything that we do. Needless to say, we cannot claim to be providers of a cutting-edge project management education without ensuring that our teachings are consistent with the basic principles and standards of the profession as espoused in the PMBOK® Guide. We like to think that the PMBOK® Guide serves as the baseline for our program and that we go beyond it. In fact, a curriculum review conducted a few years ago established linkages between all of our course components (not just the ones discussed in this paper) and the PMBOK® Guide knowledge areas. All knowledge areas are covered in one way or another, and some are covered in several ways when considering the totality of courses in the program. PMBOK® Guide is, in fact, required reading in nearly all of those courses. However, being an academic institution, albeit with a practitioner bent, we may disagree with PMBOK® Guide at times-usually our disagreement amount to a difference in emphasis. But our students do have that baseline against which to compare alternative views, and that is the most important thing.

What do our students have to say about all of this? How do we collect and process information that would be useful in assessing how the students—our customers—view the role of projects in the project management curriculum? Every student who takes a KGSM course gets a chance to evaluate that course in all of its aspects. These evaluation systems are very extensive and Keller senior management takes the results very seriously. Students assign quantitative ratings to various aspects of the course and provide qualitative responses to augment the quantitative ones. Invariably, well-conducted projects rate at the top of the list as far as utility to students are concerned, as judged by themselves. This is not to say that we have all the answers as far as integrating projects into our courses is concerned but it does speak to their value as perceived by those who work hard to achieve the results that they do—always in a 10-week time frame.

Providing meaningful projects in an artificial environment is an educational challenge, to say the least. Simulating reality is never easy. Nevertheless, we view projects to be an essential component of any course that is devoted to imparting skills necessary for organizing work in a way that yields the right outcome at the right time for the right amount of outlay. And this is what project management is all about.