Project Success: Defining, Designing, Constructing & Presenting a Capstone Project

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ABSTRACT

The culmination of many Information Systems and Information Technology degrees is a capstone project. A standard commercial project lifecycle does not accommodate an educators need to track both technical and academic project requirements. This paper outlines a project lifecycle used for one degree's capstone project, and considers its twelve milestones. Feedback indicates that students find following the lifecycle helpful in the completion of their capstone project.

Keywords

Capstone Project, Project Life Cycle, Project Supervisor, Computing Education.

1. INTRODUCTION

In preparing a student of applied information systems in the final year of their Bachelor degree, one of the most valuable learning experiences is undertaking a project for a real client with a real problem. Such experience gives the student an opportunity to use the tools and skills learnt earlier in theory classes, to create a pragmatic plan and implement a timely, cost effective solution to the customer's satisfaction. However, in the setting of a tertiary educational institution, very often the product of the project needs to be assessed both on its technical merit and on its academic value in order for the student to qualify for a credit at the 300 level.

The author, as Project Supervisor for student projects, found that the industry textbooks on project planning, while very useful and illuminating in themselves, did not provide an approach generic enough to cover the various types of projects offered by industry to students within different Applied Information Systems strands. Textbooks covering project management from an Industry perspective not only used widely varying terminologies and approaches (which taken together had the potential to confuse students) but also did not provide for the academic outcomes required.

Consideration was given to the skills, competencies and processes that needed to be demonstrated by students (including how to plan, manage and deliver project technical and academic outputs on time and within budget) as they completed their project; the relationships between these technical and academic processes and outputs; and their management.

Thus the approach taken in the development of the Student Project Life Cycle has been to synthesise useful elements from several sources and evolve a coherent Life Cycle covering both the Technical and Academic activities of the student practitioner. (Bridgeman and Bridgeman 2003)

2. A STUDENT PROJECT LIFE CYCLE FOR A CAPSTONE PROJECT

3 DESCRIBING THE STUDENT PROJECT LIFE CYCLE

The capstone project, as defined by Student Project Life Cycle, is divided into five distinct phases as follows:

Phase 1:   Finding a suitable project

Phase 2:   Defining the project

Phase 3:   Designing the project
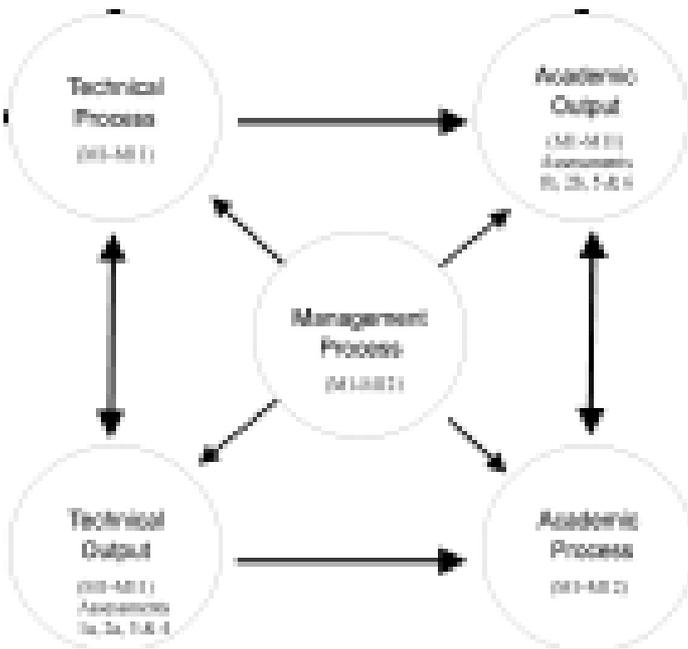
Figure 1 Relationships within a Student Project Life Cycle

Phase 4:   Constructing the project output

Phase 5:   Presenting the technical and academic outcomes

Students may, or may not, have a large part to play in Phase 1, however, they are expected to have successfully completed the processes required to meet all the milestone requirements of Phases two to five.

3.1 Phase 1: Finding a suitable project

The Finding Phase includes 1 milestone:

M0: Find a project-prepare a Project Overview Statement

Before the semester starts, intending Project students are expected to look for a possible project that they would be interested in doing. The Institute may also use its resources and contacts in the business community to source potential projects. Prospective clients may be found within the business community, the Institute or LAC members.

Prospective clients, or individual students, fill out the one page Project Overview Statement (POS) (Wysocki 2000) which gives a brief outline of the type of project and the goal desired.

In all cases the POS is expected to be signed off by the client.

3.2 Phase 2: Defining the project

The DEFINING part of the Project Life Cycle contains 5 milestones which explore an initial idea from a client as a potential project and ends with the approval of a formal project proposal developed by the student.

M1:   Define the project-prepare a Project Description Statement

M2:   Scope the Project-prepare a Scoping Report

M3:   Analyse the current system-prepare a Requirements Report

M4:   Propose solutions possible in current system -prepare a Feasibility Report

M5:   Define purpose, content & format of project -prepare the Project Proposal.

By the end of this second phase, a student should have completed an initial study resulting in a Scoping Report, a Requirements Report, a Feasibility Report, a Project Proposal, received approval from their academic Project Supervisor and Project Technical Committee to continue the project.

Each student's Project Description Statement and Scoping Report go through the Project Supervisor to the Technical Project Committee for the final decision matching students to projects.

The committee verifies that:

♦ that the student had completed appropriate courses and had the necessary pre-requisite skills and knowledge to complete the project

♦ that the problem/opportunity the project will address is of a suitable standard and complexity

♦   that the proposed project is feasible, given the 400 hour time constraint

♦   that all necessary facilities (hardware, software, sources of information etc) can be provided by the student or customer or polytechnic.

3.2.1 Preparing a Project Proposal

The project proposal is the main deliverable from the project's defining phase, and "identifies" a project. It states the case for the project, detailing what is to be done, who is to do it, when it is going to be done, and how it is going to be done. It estimates the costs and time involved. It identifies all the stakeholders and looks at the likely impacts on them. It outlines the business value, or benefits expected when the goal is achieved.

The Proposal must also include the Client Approval Checklist which the client will sign off on completion of the project, the Technical Advisor's Certificate and the Library Availability Certificate, giving permission for the final report to be available for general reference in the institute's library. (Any exceptions, such as confidentiality for the client business, must be justified at this proposal stage.)

In other words, the proposal forms the roadmap for all the stages of the project (Wysocki 2000)

It enables a student to indicate:

♦ their comprehension of the client's requirements, as outlined in the Project Definition Statement

♦ their ability to apply project management and design skills in an appropriate way for a small project

♦ their ability to judge the feasibility of the project plan within the constraints of time and the resources available

♦ their ability to produce what the client has requested.

The Project Proposal "identifies" the project that a student will complete.

3.2.2 Approval of a Project Proposal

The Project Supervisor takes the project proposals to the Project Committee for joint consideration.

To be approved as being of a suitable standard, capstone projects must be at least the level of case study material used in 300 Level Courses.

After having gained the Project Supervisor's and Project Committee's agreement that the Project Proposal is of appropriate standard, students may begin work on the project, as outlined in their Project Proposal.

3.3 Phase 3: Designing a project

The Designing Phase includes 1 milestone M6:

3.3.1 Different types of project-different process

The exact content/structure of the next two phases (designing/constructing) of the Project Lifecycle will vary from project to project, depending on the type of project. A student needs to develop their project proposal carefully to identify what it is appropriate for them to do during the Designing/Constructing phases. This phase must include output from 4 additonal individual milestones (as defined by the student) in consultation with their client, as well as meet the requirements outlined in the Project Lifecycle milestones M6, M7, M8, and M9.

M6: **Carry out Evaluation/Procurement Data Analysis** or Design the New System (System Analysis and Design Report)

3.4 Phase 4: Constructing a project

Constructing a project has three milestones; M7, M8 and M9:

M7: **Documentation of Written Communications/Change Reports**

M8: **Records of Installation Test/activities. User/Technical Help documents**

M9: **Client Acceptance**

3.5 Phase 5: Presenting a Project

Students are required to hand in three printed and bound copies of their Project Technical Report and three printed and bound copies of their Project Academic Report.

In addition, students are required to make an oral presentation of their project, backed by PowerPoint slides.

M10: **Audit of Project**

M11: **Publish Technical and Academic Reports**

M12: **Oral Presentation of Academic Report**

3.5.1 Allow enough time

Nearly all students find that the actual write-up, assembling and publication of their Technical Report and Academic Report takes much longer than they expect. The preparation of the first drafts of each may be the most difficult part of the work, but the transformation into a copy for final publication usually takes longer than planned.

Two, or even three drafts of a project's Academic Report may be needed before a satisfactory final result is achieved, so plenty of time needs to be allowed for consultation with the Project Supervisor, plus the writing, editing and refining process.

Likewise, preparation of PowerPoint slides and the oral presentation to go with them takes time. Students are advised prepare well ahead of the deadline, allowing time to practice and amend if need be.

**Figure 2 Diagramatic representation of a Student
Project Life Cycle**
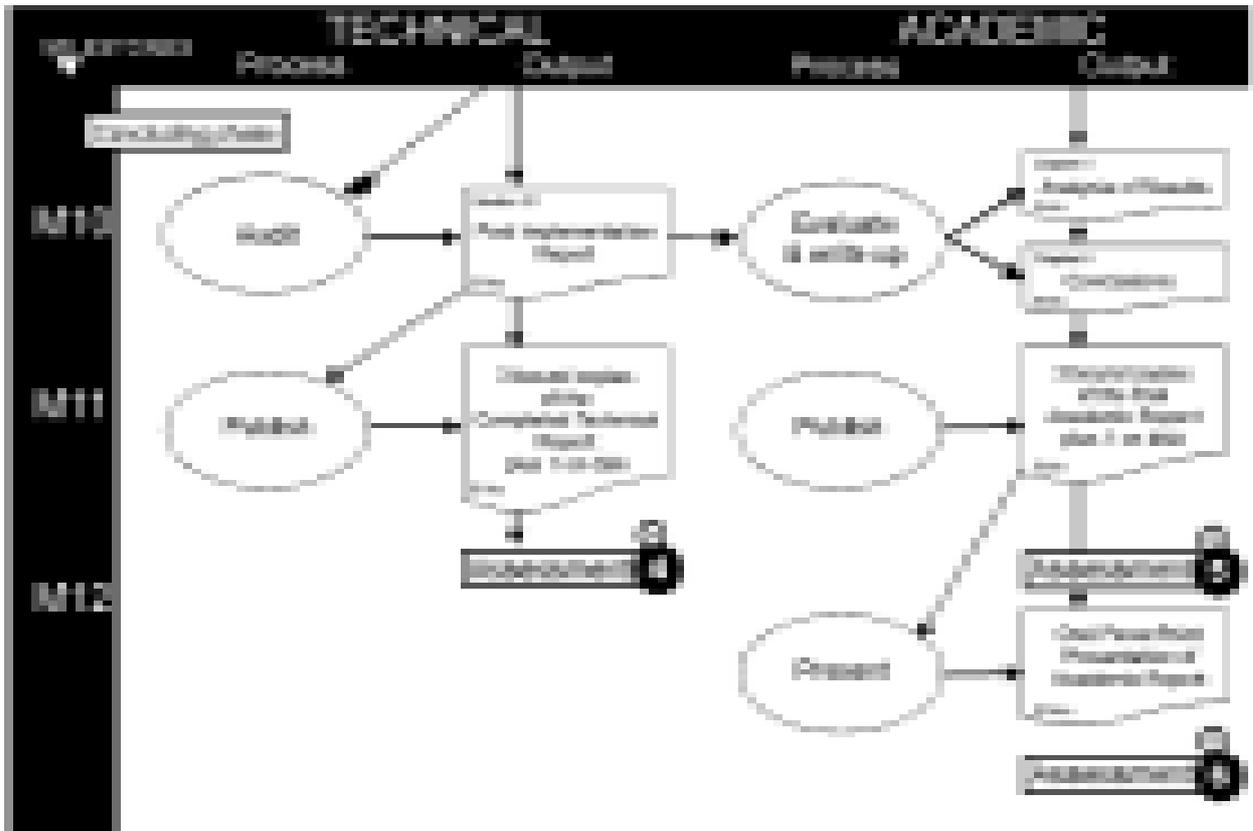
3.5.2 Project Technical Report

A Project's Technical Report is a stand-alone document that must be capable of conveying to the client all the relevant technical information about the project (identification, planning, activities, etc) without access to the Academic Report or the author of the report for supplementary verbal explanations.

A Technical Report is divided into sections corresponding to the Milestones 1-9.

3.5.3 Project Academic Report

A Project Academic Report is a stand-alone document that must be capable of conveying to the reader all the necessary information about a project; (planning, activities, outcomes, possible improvements etc) without the Technical Report or the author having to give supplementary verbal explanations to the reader. It's purpose is to record, evaluate and reflect on the process of doing the project and the results obtained. It will go into the Institute's library as a permanent resource.

It is written in the student's own words as objectively as possible in plain unemotive English. As a general rule, personal pronouns such as I, we, you, me, my, our, and us are not used.

3.5.6 Using the Project Proposal

as a basis

The Project Proposal that "identified" the project serves as the basis for the Project Report. The writer can then ensure that all sections of the proposal are addressed. An explanation needs to be given if there are any parts of the Project Plan that were not completed.

3.5.7 Length of Academic Report

The writer of a Project Academic Report should be striving for QUALITY of writing, rather than QUANTITY. They should resist the temptation to add unnecessary words.

As a guide, these are the average chapter lengths expected:

Chapter 1	2-3 Pages
Chapter 2	3-5 Pages
Chapter 3	10-15 pages
Chapter 4	10-20 pages
Chapter 5	3-4 pages
Chapter 6	2-3 pages

i.e between 30-50 pages for Chapters 1-6.

Past experience indicates that students can get into difficulty if they leave the writing up of the Academic

Report until the end of the project. Hence the Milestones in Part 2 specify that each Chapter be drafted as the relevant Milestones are being undertaken. This encourages students to reflect on the process as they move through the project life cycle. It will also greatly reduce the writing load in the final stages allowing more time for thorough editing and revision.

3.6 Submission of Technical and Academic Reports

3.6.1 Pre-Checking of Academic Reports Prior to Printing

Prior to the final printing and submission of the Project Academic Report (3 copies), a student is strongly advised to consult with the Project Supervisor. At this point in time, an initial review will be done of the report to see it is of a required standard for assessment. This can save a student much time and expense.

3.6.2 Publication of Project Reports

♦ All sections of the Technical Report must also be bound into a single complete document.

♦ Academic Reports must be typed and all sections securely bound into one complete document.

♦ For Academic Reports, typed copy should be 1.5 line spaced, with quotations (other than very short ones) indented and in single spacing.

♦ All pages must be numbered.

♦ Usually, report will be printed on one side of the paper only, with a 2.5cm" left hand margin. Students must get permission from the Project Supervisor to do otherwise.

♦ Print three copies of each report

♦ Use "Fastback" Binding

♦ It is the student's responsibility to submit to their educational institute for examination purposes, THREE bound copies plus ONE electronic copy of their Project Report and THREE bound copies plus ONE electronic copy of their Technical Report.

♦ Additonal copies may be needed for presentation to the client.

3.7 When the technical deliverable is also a publication

In some kinds of projects the technical deliverable of will be in the form of a published document. (For example, when the project is to document a large existing system for the client.) The above criteria apply to this document as well. In this case the student will present three published documents as their project submission.

3.7.1 Payment of production costs of Project Reports

This is between the student and the client, and is to be agreed to at the beginning of the project. This is particularly important if the client is also to be provided with a bound copy of the final Project Report.

3.8 Presentation of Academic Report

Students are expected to prepare and deliver a 10 minute presentation of the outcome of their project, as described in their Academic Report

4. CONCLUSIONS

This paper has described a Student Project Life Cycle that has been devised to address the need for students to be exposed to both industry and academic processes as they complete their degree by undertaking a project for a real client with a real problem. To successfully complete this Life Cycle, a student needs to follow a process that requires them to demonstrate sufficient skills, competencies and process (including how to plan, manage and deliver project technical and academic outputs on time and within budget) to complete their project; plus demonstrate an ability to manage the relationships between these technical and academic processes and outputs.

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