The Student Enrollment and Course Tracking System Meta-Project

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Abstract - This paper discusses an innovation in teaching the Systems and Software Development Life Cycle (SDLC) in the Graduate School of Management and Technology at University of Maryland University College. The innovation is a Meta-Project that takes the form of a series of linked projects across the four classes that cover the SDLC. The benefits that the Meta-Project provides the student with, are a better understanding of the interaction between the phases in the SDLC, and a better ability to cope with the vagueness of the real world.

I. INTRODUCTION

In most education environments, the trend is not geared toward tightly coupling the educational programs with the Systems and Software Engineering Environment. University of Maryland University College (UMUC) however, has created a program geared toward ensuring that students who are enrolled in their classes can apply the knowledge gained in these classes to their real world projects. The Student Enrollment and Course Tracking System (SECTS) Meta-Project is designed explicitly to tightly couple the courses offered in the educational system with the real world.

II. BACKGROUND

UMUC offers educational opportunities to students who work full time and wish to increase their skills and knowledge by studying in the evening. One of these opportunities is the chance to earn a Master of Science degree in Computer Systems Management (CSMN). As part of the requirements for the degree, students specialize in one of four tracks or majors. One of these tracks is the Software Development Management (SDM) track. Students in this track take classes in 'system and software requirements', 'design', 'testing', and 'maintenance'. It was difficult for students to get the full benefit of working on projects because

- There was little connectivity between the courses in the track
- The undocumented background knowledge for each individual project scenario was lacking and could not easily be obtained in a 15-week semester.
- While the advisors recommend the classes be taken in sequence there is no requirement to do so, and consequently most students do not take the classes in the optimal sequence.

The SECTS Meta-Project was introduced in the Fall 1997 Semester in an effort to overcome these limitations in the courses in the SDM track. The purpose of the Meta-Project which undergoes a new iteration each semester, is to:

- Provide some continuity between the different classes in the SDM track of the CSMN program.
- Minimize the effect of lacking pre-requisite knowledge in students taking the classes out of sequence.
- Allow each of the students in each class to perform the project without depending on information from the then current iteration of the other classes (minimizes coordination problems).

The main requirement for the Meta-Project was to provide a series of linked projects that would allow the students to become familiar with the background to a specific project in a minimal amount of time. As the students already use the Interactive Registration and Information System (IRIS) at UMUC to register for classes, check out grades, and add and drop classes, they are somewhat familiar with the system. The Meta-Project was designed with this undocumented knowledge in mind, and examines the different aspects of the SECTS during the various parts of the Software Development Life Cycle (SDLC).

The Meta-Project scenario is as follows. Hypothetical University (HU) not UMUC is experiencing problems with the SECTS used to enroll students and track their courses. The focus of each class is as follows:

- **System and Software Requirements (CSMN 645)** – develops the system and software requirements for the SECTS.
- **Software Development and CASE Tools (CSMN 646)** - designs the SECTS based on the requirements provided by CSMN 645.
- **Software Verification and Validation (V&V) (CSMN 647) -** verifies the requirements for the SECTS and develops a Test Plan for validating the design.
- **Software Maintenance (CSMN 648)** - examines the SECTS from the maintenance and change control perspective.

The Meta-Project makes an excellent framework for classroom discussion. It provides a project for each of the

classes in the SDM track. The students in each class are split into teams who work independently to produce a product with common guidance lectures, discussions, and reviews. The student teams, having different skill sets and experience mixes tend to produce different products. Consequently, part of the project reviews in each class covers the differences between the approaches used by the teams (Meta-Project). This tends to bring the effect of the real world into the classroom.

Each class has a slightly different starting point as described below.

- **CSMN 645 Scenario.** With the manual registration process currently in use, the load of paper work imposed on the HU's staff and its faculty is tremendous. The students develop the operations concept and write portions of the Requirements Document for the new system.
- **CSMN 646 Scenario.** This class performs the top-level design of the system based on the Requirements Document produced by a previous iteration of the CSMN 645 class.
- **CSMN 647 Scenario.** The class performs the V&V on the:
    - Requirements Documents produced by previous iterations of CSMN 645, and
    - Design Documents produced by previous iterations of CSMN 646.
- **CSMN 648 Scenario.** In anticipation of the completion of the SECTS development contract, HU released a Request for Proposal (RFP) for a software maintenance contract. The period of performance of the resulting contract would commence after the handover. Several proposals were received and the maintenance contractor selected. At the time the class begins, the development of the SECTS is almost complete and there is a contractual dispute between the development contractor and HU (customer). The maintenance organization will thus have to take over the system "cold turkey", in an "as-is" condition. However, the maintenance contractor bid on a RFP that assumed a smooth turnover. Student teams have to develop a Maintenance Plan for the SECTS Software Maintenance Organization.

The Meta-Project converts the situation in which students can enroll for the classes in any order and may in fact be in two of the classes at the same time from a liability into an asset. It does this by allowing students to use knowledge gained in other classes to improve the product produced by their team in a specific class. For example, students who have taken CSMN648 will be sensitized to the importance of writing 'maintenance requirements' in CSMN645 and will explain that importance to their team members. Similarly, students who have taken CSMN646 will be sensitized to the importance of writing 'design requirements' in CSMN645.

The students thus experience the entire SDLC of a system in four semesters. They learn by completing their assignments in the phase of the SDLC covered by the class. They do this handicapped by the consequences of poor performance up-schedule in a previous phase. Consequently, they develop an awareness of the effect of poor performance in any phase of the SDLC on its later phases.

III. PRELIMINARY RESULTS

Since the Meta-Project has been in existence, results have been mixed in the short term.

A. Initial faculty response was mixed

While the students continue to enroll in the SDM classes related to the Meta-Project in each of its incarnations, the faculty in CSMN 645 has shown mixed feelings. Out of the five times it has run (with four professors), one professor ignored it as best he could, and a second professor made it an optional project in his class.

B. Quality control

The project has also illuminated problems in the program that were previously masked. For example, in its first iteration, it showed that the Requirements class (CSMN 645) was not teaching the students how to write good requirements. Using a Requirements Workshop alleviated this problem. The Workshop showed the students difference between good and bad requirements and actually dissected and tested a real world signed off Requirements Document produced by a contractor to the National Aeronautics and Space Administration (NASA). In the next iteration of the class the students complained that it did not teach the difference between system and derived requirements. This was addressed in the third iteration.

C. The real world is too vague

In general, students seem to like the varying perspectives of the approach and the fact that the knowledge acquired in one class can be applied in a second much like in the real world. However, when the teacher simulates the vagueness of the real world a number of the students are less than happy. They are used to academic exercises in which they are provided with complete information. In this series of projects, they are not and many complain. For example, in CSMN 648 the students are provided with minimal information to produce the SECTS Maintenance

Plan (e.g., lack of complete information from the customer, a role played by the instructor of the class). Students are challenged and frustrated by this concept because they are required to "think" the problem out for themselves without much instruction.

This concept mimics the real world in wherein they make decisions based on incomplete and inadequate information. Several students complained (within their groups and during class sessions) that they were not provided with adequate information to get started on the project. These students did not want to have to figure out how to get the rest of the information that was needed in order to complete a project (i.e., Software Maintenance Plan) on their own, they wanted it handed to them. They do not seem to realize they are also being taught that to succeed in the real world of the SDLC, they needed to take a more proactive approach in getting the required information from the customer. The teacher had to reiterate the three stages of a project and how they differ between industry and academia:

- **Traditional classroom** – confusion, clarification, and completion.
- **Real word** - confusion, completion, and clarification (perhaps).

It seems that in general, and based on a small sample, that the more work experience a student has had, the greater ability the student has to deal with vagueness. This is a critical skill that does not seem to be taught anywhere else in the program. The cross-fertilization of knowledge and team interaction helps the students in acquiring this critical skill.

IV. TRENDS TO THE FUTURE

As more students experience the project they carry over knowledge to the other classes. Precocious students who go that extra mile to achieve an 'A' really think through the project and demand very detailed information. This keeps the teachers busy and may be one factor that has led to mixed faculty responses. After all, most of the faculty are adjunct professors and operate in the real world during the day. However, it is also improving the caliber of the products produced by the students and hence the expertise of our graduates.

V. CONCLUSION

The Meta-Project provides the student with a better understanding of the interaction between the phases in the SDLC and a better ability to cope with the vagueness of the real world. As iterations of the courses in SDM track continue and issues are uncovered, the Meta-Project will adjust and improve itself. This will help to provide UMUC with an educational program that is geared toward preparing the students to cope with the projects that they will be expected to complete in the real world.

VI. SUMMARY

This paper has described a Meta-Project that provides the students at UMUC with a better understanding of the interaction between the phases in the SDLC and a better ability to cope with the vagueness of the real world. As with any new project, the initial reception has been mixed. The SECTS Meta-Project links a series of projects in each of four classes by using products and skills developed in one class in others.

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