

## Model project-based learning using real world projects in the Information Sciences and Technology curriculum

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*Abstract— this paper reports on real world project based experience and learning with computer information science and technology projects and Penn State University campuses (Mont Alto & York). Working on the real world experiences improve the collaboration with industry and emphasizes on the team projects. This paper also deals with reasons for developing and implementing the real world project approach in IT project management, system analysis and design courses and Capstone project courses. It will also outline the modifications that were gained after the first experiences with this type of approach. Finally, we summarize the student's perspectives and learning experiences, as well as faculty experiences with collaborating with industry.*

**Keywords— Higher education, industry-university collaboration, team projects, project management , project based learning**

### I. INTRODUCTION

The focus of the paper is experiences of project-based learning using real world projects in the Information Sciences and Technology curriculum.

In current years, project-based learning has been supported by computer technologies and has contributed to development of student-directed scientific inquiry of problems in a real-world setting (Barak and Dori 2005). Faculties need to take part in planning the environment for technology integration and promote inquiry, problem-solving and critical thinking in their classroom (Pedroni 2004).

At the Penn State York and Mont Alto Campuses, IST 302 is an Information Technology Project Management course that is required by all IST (Information Sciences and Technology – Integration option) students. In addition to learning theory students in this course are typically engaged in working on real-world”classroom projects.

The purpose of the group project activity is to provide the proper setting and stimulus for learning for students. Group dynamics, team communication, information gathering, presenting project proposals, and documenting their accomplishments in the form of project management plan serves as a student-learning portfolio within the academic environment.

### II. WHAT IS REAL WORLD PROJECT-BASED EXPERIENCE LEARNING?

One of the beneficial models of instruction involves having students work to investigate a solution to real world problems. Projects subject matter could vary in scope and levels. Real world projects put students in an active role such as being a problem solver, a decision maker, an investigator, a leader or a documenter. All the projects perform specific, significant educational goals; but based on a real world problem. The students have to work with external stakeholders and being able to communicate and follow the requirements.

### III. BENEFITS OF REAL WORLD PROJECT-BASED LEARNING

Real world project-based learning offers many benefits both for students and faculties.

An increasing number of academic researches support the use of project-based experience

Increased attendance, growth in self-confidence, and improved attitudes toward learning

(Thomas, 2000). Another research shows that in project based learning opportunities are more in order to develop complex skills, such as higher-order thinking, problem-solving, collaborating, and communicating (SRI, 2000).

According to ISTE research, the benefits attributed to project-based learning include increased student motivation, increased problem-solving abilities, improved library research skills, increased collaboration and increased resource-management skills (ISTE, 2001). Students are motivated when working for a real client, gain confidence in their abilities and are proud of the project they have completed (Chen, 2006). Students can add the projects to their resumes to show relevant work experience, particularly if they have no prior internship experience. The learning of technical and interpersonal (i.e. communication, time management, and project management) has shown to translate to marketable skills (Scott 2006; Janicki et al., 2007). In order to enrich the IST project management

course experience we have involved the students with real world projects through partnering with business organizations

#### IV. COURSE MODEL

The proposed model for the IST 302 project management experience is the integration of the class room environment, student’s perspectives with an external business organization and tools to manage the documentation and communication (Figure 1). This model provides students with a better understanding of project management experience with combining the classroom experience with real world work experience and using the tools to help them communicate and document the process.

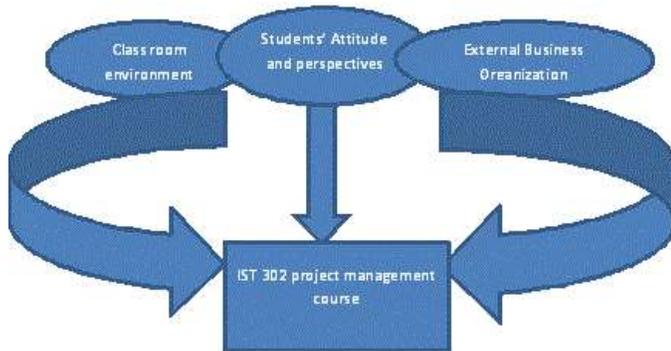


Figure 1

#### V. CLASSROOM ENVIRONEMENT

The topics that are typically covered in this course are topics such as knowledge of project management terms and techniques, project management knowledge areas and process groups, Life cycle, tool and techniques of project management, such as

- Project selection methods
- Work breakdown structures
- Network diagrams, critical path analysis, and critical chain scheduling
- Cost estimates
- Earned value management
- Motivation theory and team building

Mini cases were used in the group and individual assignments in order to reinforce user the above mentioned objectives.

The course enrollment at York and Mont A lot is typically around 15 students who are assigned to project teams consisting of three four members per team. Each project may have the same or different external business organization sponsors.

The primary student learning outcome for this course is to develop the project management plan.

This plan covers the deliverables for a real world IT project for the client. The deliverables usually include: the business problem and need, the project scope, the feasibility studies for the project (i.e., financial, technical, operational, and schedule), the project development time and cost, the new business process model, and system requirements. In some case some part of the project management plan will be implemented , but that needs to be stated in the scope of the project.

The secondary student learning outcome for this course is to be able to document and manage the communication, documentation, develop lesson learned by looking at their process, within their team. Usually students need to use an online document management tool. In many cases they have used Google docs to manage the team documents and communication. Also, they have used angel (Penn State Content management) system to create a shared folder as well. Throughout this project, project management skills is emphasized as teams must manage project sponsors expectations, project timelines, and deliverables.

#### VI. EXTERNAL ORGANIZATION

Partnering with the business community is an vital component of a student’s education

As well as a way for our students to secure potential internships and future employment. The advisory board has been established at various universities , and its benefits are widely recognized (Janicki, 2006; Koong,2003). We have worked with the Chambersburg Chamber of Commerce, York Chamber of Commerce, Deloitte Consulting, Advising Center (at Penn State York), Nittany Success Center (at Penn State York).

In such scenarios typically the e external clients agree to meet with the project team so that the team can understand the requirements and are in communication with the client to be able to deliver the final product within the scope, on time and meet the expectation of the stakeholders.

The faculty of the course typically meet with the external client prior to the course to identify projects that are technically, schedule, and economically feasible. The purpose of such meeting is to ensure the implementation of the project with technology available, within timeframes by the student teams that coincide with the academic semester, and that will be beneficial to the external client. The routine meetings with the client throughout the semester help build a relationship between the IST department and the business organization, as well as it allows the students to observe the client's work environment. The semester generally ends with oral presentation to the client, other IST students and faculty.

VII. PROJECT CASE STUDIES

In this paper we describe two case studies that were observed and documented during the fall of 2011 in the IST 302 courses in Penn State York and Mont Alto Campuses. The first case study describes the project and international Student's experience and perspectives throughout this course at Penn State York.

A group of nine students came to Penn State York from India in the Fall 2011 as part of the IST degree program. They took IST 302 as one of their first courses as transfer students at Penn State York. The students were required to work on real world IT group project. The class was divided into four groups, each assigned with a unique project. These groups consisted of 3 to 4 students. The groups were a variety of international and local students.

One of such projects was sponsored by Deloitte Consulting, a multinational consulting firm. Deloitte take up multiple projects worldwide, and as a result they go through various resource allocation and staffing issues. The recruitment process is extremely time consuming and labor intensive. It requires the recruiting personnel to collect job descriptions, send out job specifications, collect resumes of the applicants, screen them manually for finding the best fits, schedule interviews, and finally, send an offer letter to the most deserving candidate. The team was required to create a project proposal (plan) that satisfies the requirements of automating and thereby simplifying the employee recruitment systems at Deloitte, making it considerably less time consuming and less labor intensive. One of the main requirements was to recommend off-the-shelf software that would ease out the recruitment process by automatically screening the applicants for best fit for the given job, assisting in interview scheduling process and maintaining a database of applicants for future use. Although the projects were an overall success, in the due course of the project, the international students faced specific issues. Lack of communication, language jargon/misunderstandings and lack of proper understanding of the domain culture were some of the key issues. The students from India had never worked on such real world projects before. So, they lacked the experience of working in teams. Requirements gathering, gaining all the required information from the customer was difficult for them. They were not used to doing follow up of the meetings. Also, they are not open to asking questions because they feel that asking too many questions makes them come through as stupid. They also had some language jargon/misunderstandings within the team. The local students would ask them to do something and the international students would interpret in some other way, leading to inconsistency in the work and confusion. The international students had limited exposure to domain culture. The working styles were different. Indian students were optimistic about deadlines, whereas locals were well organized. The international students did most of the work in the last minute, which did not go well with the locals. International students lacked experience in the proper project

documentation as well as presentation skills. As one student states "working on IST 302 real world IT projects were a learning experience". "Now the international students have knowledge about the US culture and working style by working in proximity with the local students". They are better off at project documentation. As Dr. Shah states "their presentation skills have been sharpened as well. They now understand the importance of asking questions". IST 302 has certainly proven to be an educational journey for the international students, teaching them the culture and working style in the US. The second case study describes the project and local Student's experience and perspective's throughout this course in Penn State Mont Alto

The class was divided into four groups, each assigned with a unique project. These groups consisted of 3 to 4 students. One group was working with. The purpose of the project was to attract people to the Downtown Chambersburg website, its social media pages, and have people complete the survey, according to the requirements specified by the client. All activities directly related to the purpose are considered to be in scope. All activities not directly related to the purposes are considered to be out of scope. For example, issues concerning the website being unavailable are not within the scope of this project. The objectives of the project are as follows:

- Increase the fan base of the Downtown Chambersburg Facebook page by at least 50%
- Increase traffic to the new website (reasonable metric TBD)
- Garner at least 300 completed online surveys

The project deliverables were project management, marketing plan, design of the marketing flyer; work on the Facebook ads and to finalize the flyer distribution plan, and the mail list marketing campaign. The students signed the project charter with the organization and were committed to the project. During the course of the projects the students sent a weekly progress report to the Vice President of Greater Chambersburg Chamber of Commerce which was the main stakeholder in this project. Also, the student were visited her office to understand and work with her with the Facebook Ad campaign. Students also used Zoho Projects which is online open source project management software with collaboration and bug tracking that allows project teams to collaborate and get work done faster. Planning and Tracking helps the student keeps your project on schedule, and they have used Zoho Project to share our ideas between us as a group. Using this management software has helped them in a great manner, as they got the opportunity to upload any ideas that had to share, assign tasks and keep track of the progress. Also, meeting minutes were documented in meeting minute templates. Microsoft Project- is software that the students have used though out this project to be able to have a Work Breakdown Structure for the tasks in the project.

The project were completed, some of the objectives were met. Communication was a problem in some cases with the

stakeholder and within the team members. The student has learned various skills from this project. Some lessons learned in this experience as following: problem solving, team work, time management, documentation, and communication skills with stakeholders, and presentation skills. They also have identified some problem within team such as late delivery of the tasks by team members, not being able to meet outside of classroom due to conflict of the schedule, did not have adequate planning of project tasks and assigning them to individual team members early in the process. As Ariq Mansur says "It's a learning loop: us students gain a better understanding of what it means to use design thinking outside the classroom, and our partners deepen their own innovation methodology" Some other comments from the student are from the lessons learned are as follows:

"Project management partnerships is extremely valuable to students in gaining

Hands on experience". Student 1 "Learned how to create a marketing campaign on Facebook" Student 1 "we have learned how to work in teams and being able to meet the deadline for the stakeholder." Student 2. "The progress report to the stakeholder and being able to visit their location was very helpful in understanding the problem." Student 2. The stakeholder that was involved in the project wrote the feedback at the end of the project for the students.

#### VIII. FACULTY EXPERIENCE AND PERSECTIVES:

During this real world project experience, projects were extremely faculty time intensive, and most of the time, they had to act as a project manager between the student's and the stakeholder. Faculty members also had to learn to let students do the work themselves and faculty must avoid micro managing the teams and let them be the owner of their project. In order to make sure that project is progressing, and the deadlines are met, faculty needed to receive progress report from the teams and the students had to use the digital drop box on the content management system to deliver the milestones of the project by the due date. Faculties also had to assure as much as possible that there exist a built-in accountability of individual team members for their fair participation and contribution to the project, The right to dismiss a team member by the whole team was implemented in the class policy, and were enforced throughout the project.

#### IX. OVERALL SATISFACTION OF THE ORGANIZATION

The overall success of the project was discussed with the stakeholder of the project. The stakeholder provided their feedback about the project and process. Some select excerpts are:

Noel Purdy VP of chamber of commerce "Regarding the process, I appreciate that I had the opportunity to meet with all of your team members at one time, and everyone could ask various questions. I think this set a positive tone for the project

and did a lot toward getting folks on the same page regarding expectations. I believe we had at least one teleconference during the project, and your teammates had great questions, and I'm glad that you chose to do a teleconference rather than handle via email. Communication is the hardest part about every project; your team seemed to manage this aspect successfully." "Students need to be able to take the lead in the project". (Purdy, 2011) "Everybody is motivated by challenge and solving problems, and we do not make use of that in schools enough," says Bruce Alberts, Professor Emeritus at the University of California, San Francisco, and former president of the National Academy of Sciences (NAS). "Project-based learning gives everybody a chance to sort of mimic what scientists do, and that is exciting. And it is fun if it is done well

#### X. CONCLUSION

The field of technology is growing rapidly and the businesses are relying more on IT staff. Now days the IST graduates need to have the technical skills as well as set of soft skills such as project management, team work, communication, and understanding organizational structure. Still in the IT fields many projects are failing and many project managers do not have the necessary training to be able to manage the projects. It is very important for the academics to prepare the students to enter the successful careers. In IST 302, IT project management class we have given this opportunity to the students to strengthening this experience by providing students with acceptable opportunities to practice and develop their soft skills as well as their technical skills.

In this paper, we presented an enhanced IST 302 model and the results from our case studies from fall 2011 classes. This model integrates three important components (i.e. the classroom, external business partnerships, and students' experiences and perspectives). From this experience the Lessons learned from these experiences will be documented and these will help other students and faculty members how to effectively participate and manage their class-room IT projects both locally and globally". The field of technology is growing rapidly, and the businesses are relying more on IT staff. Now days the IST graduates need to have the technical skills as well as set of soft skills such as project management, team work, communication, and understanding organizational structure. Still in the IT fields many projects are failing, and various project managers do not have the necessary training to be able to manage the projects. It is extremely valuable for the academics to prepare the students to enter the successful careers. In IST 302, IT project management class we have given this opportunity to the students to strengthening this experience by providing students with acceptable opportunities to practice and develop their soft skills as well as their technical skills. In this paper, we presented an enhanced IST 302 model and the results from our case studies from fall 2011 classes. This model integrates three key components (i.e. the classroom, external business partnerships, and students' experiences and perspectives). From this experience the

Lessons learned from these experiences will be documented , and these will help other students and faculty members how to effectively participate and manage their class-room IT projects both” locally and globally”.

#### XI. FUTURE RESEARCH

Future research will include developing quantitative measures to test the model’s success, as well as developing a work book with case studies to help students in understanding the process before applying it to the real world project. We also will apply this model for conducting and managing a real world project with a client in another country at a global level.

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