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Lessons Learned From A Decade Of Using Community-Based Non-Profit Organizations In Information Systems Capstone Projects

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ABSTRACT

This paper examines a decade of our institution's use of community-based non-profit organizations (NPOs) in the information systems capstone course. Information systems or computer science majors often have technical skills but lack an adequate understanding of organizational processes, team project experience, and the ability to integrate information technology into an organizational setting. To bridge this gap, we use group projects that leverage local NPOs. We document lessons learned from our decade of using community-based projects to provide recommendations for successfully implementing similar courses.

Keywords: Capstone projects, non-profit organizations, community-based projects

1. INTRODUCTION

As described in a paper on 'socially-relevant' projects, Buckley et al. recommend students work on actual projects for real customers. (Buckley, Kershner, Schindler, Alphonce & Braswell, 2004) We applied their recommendations to have students in our capstone course work on projects that serve the greater good of the community, replacing instructor-developed projects. We revisit the efforts our institution has taken using community-based NPOs in information systems capstone projects, and present recommendations for successfully implementing similar capstone courses at your institution based on our decade of experience.

We extend earlier efforts of utilizing service-learning projects by addressing specific issues in the use of a NPO in a socially relevant, community-based project. There have been numerous documented examples where students benefit when working with an actual local company in their capstone project course. (Buckley et al. 2004) (Hoxmeier & Lenk, 2003) Students are provided with the opportunity to apply the knowledge gained in the classroom to real-world challenges and deal with interpersonal relationship issues in a workplace setting. (Lazer 2002) As also evidenced in our experience, students receive additional benefits from working with community-based NPOs, including but not limited to: (1) Working with socially relevant projects having a visible impact, often motivating them to do their best work. (2) Producing a complete working hardware and software project for real customer's requirements, another potential motivating factor. (3) Focusing on first understanding customer requirements and developing a high-level design prior to formulating a solution. (4)

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Experiencing having an impact on the reputation of the University in the community. (Buckley et al. 2004) As documented in this paper, our experience corroborates earlier literature.

Background

The case for using socially-relevant, community-based, projects has previously been extensively documented. (Buckley et al. 2004) (Jacoby 1996) (Lazer 2002) We support and add to the pool of research that recommend such projects. In addition, the ACM and ABET accrediting bodies and curriculum task forces have identified several trends that affect the information systems curriculum. They include the need for increased group projects, better coverage of efficient project management techniques and processes, and social and professional exposure.

The case for community-based projects

As described in their paper on 'socially-relevant' projects, Buckley et al. recommend that students work on projects for real customers. They promote using projects for the capstone experience where they are developed to serve the greater good of the community, replacing instructor-developed projects. In their study, students working on projects that did not seem to have application outside the classroom often lacked attachment to the project. Specifically, students seemed to be more concerned about grades and meeting instructor expectations then they were with the project itself. In a community-based project, students benefit from having provided useful products for an organization that might otherwise not afford them. Thus, students are more likely to see their work as important and worthwhile as it is no longer merely a classroom exercise. (Buckley et al. 2004) (Hoxmeier & Lenk, 2003) (Lazer 2002)

The experiences observed at our institution verify and confirm the above observations. Students were more motivated and produced a higher quality of work with a greater sense of accomplishment. The benefits of this capstone experience on an individual students' education, and the benefits of providing useful software to NPO organizations were demonstrated. In addition, we observed that students often expressed enthusiasm and pride in their projects, and the University developed an enhanced reputation in the community. Students experienced the benefits of taking responsibility and being accountable in a situation where the organization they served truly needed and appreciated their help. Hoxmeier and Lenk describe this benefit as providing a "personal emotional intensity" that students would not experience in the classroom. In this multi-dimensional learning environment, students are expected to provide professional and technical services while in the role of the student. As a student they must evaluate and analyze a complex project in order to design and implement real-world solutions. The student benefits from a deeper understanding of the technical knowledge covered in previous courses, learn or enhance project management skills, and demonstrate the value of their information systems knowledge to their community. (Hoxmeier & Lenk, 2003) In this "win-win" situation both the student and the client benefit from each other's contribution in collaborating on a working project.

2. THE PROBLEM

Educators have utilized group projects for years. Those who have taught using team projects know they often present challenges, including motivating students, unclear initial specifications, determining appropriate workload given the size of the group, providing on-going sources for new projects, and providing an excellent learning experience. In 2001, we instituted an NPO-based project capstone course to address some of these issues with significant success.

3. LESSONS LEARNED

Over the past decade, we have collected assessment data and anecdotal evidence of what has worked well, and where we could improve the project course processes. The primary purpose of this paper is to share some of those lessons learned.

An analysis of the projects from the past 10 years shows success when compiling the data from the NPOs. Of nearly 100 projects completed with over 60 separate organizations, all but six projects would be classified as a "success". At the final presentation, if the NPO is happy with the result, all goals specified at the beginning of the semester are met, are going to use the hardware and software produced and is proud to suggest our program to other NPOs, the project is classified as successful. End of the semester questionnaires completed by the NPO Executive Directors are evaluated and scrutinized to obtain insight into the program,

projects and overall satisfaction. Most projects are followed with resounding praise from NPO personnel, with one project launched into a national release within the NPO.

Identifying NPOs for Capstone Classes

Locating NPOs that have qualified projects for use in the team setting for Information Systems capstone projects is a continuous quest. The professor needs to find the NPO, identify the project(s), determine the true commitment of the NPO to the project, accurately establish specifications for the project, and ascertain financial considerations. While the actual distribution of the projects to the student teams may occur a few weeks into the semester, the preliminary work for the professor will occur months in advance. Identifying a NPO that has needs for an IS project is more about the project, than it is the NPO. Smaller NPOs have greater need for IT support, but may not have the vision to know what they need. Requests such as "help us with our data" or "we need a web page" are valid statements, but don't truly identify what their needs are. Thus, a team, of 4 students, could easily go into an organization, and write a freely downloadable MS SQL Express database to organize reams of paperwork, network the multiple computers so they are truly working off the same database, and write up a multipage web site to support the organization.

Another issue with the NPO is the time commitment. While many will say they would love to have a project completed, some will admit that they don't have time to meet with the students on a weekly basis. Without students receiving a critical understanding of the needs of the organization and direction of the NPO personnel, the project can quickly veer off the course of the original project. While it does not need to be the same NPO representative to meet with the student team each week, someone that is clear with the goals of the project must be provided. In addition, the professor should meet with the NPO regularly to gain feedback. For these meetings, face-to-face discussion is much clearer and informative than email or phone calls.

Preparing the Students for the Projects

While students are often ready to analyze and tackle the technical aspects of a project based on their education at the university, there are many other "real life" skills that are not as easily taught. In order to make the service learning more professional for the NPO and the students, a series of lectures on professional work skills is given prior to the students being "released" to the project. This series of groundwork lectures are designed to supplement the student's ability to handle a real world IT project. Lectures in business etiquette (business communication, acceptable corporate attire, and interacting with corporate staff), technical writing, software engineering and problems in software development are some of the elements of this coverage.

Unfortunately, the world we live in today is very litigious. To help prevent any issues, a set of agreements should to be signed by students and the NPOs before the projects move forward. One requirement is to release to the NPO, all the intellectual property rights developed in the project. This document can also serve as a confidentiality agreement with the student and the NPO. One final set of documents should be signed to give rights to take photos and use them for public relations.

Coordination of the Class / Semester

Once the student teams are assigned to NPO projects, the class format changes from a traditional classroom setting to a corporate business project format. Students transition from the classroom to work in a collaborative environment for all communication between team members and with the NPO, and submit formal weekly corporate activity reports to a team forum. Open submission promotes honesty and accuracy in the project progress. At this point, it is important for the professor to monitor the forum daily and comment as necessary. Acting in a corporate manager role at this time, the professor monitors daily progress but does not actively direct the team.

Difficulties in class coordination

With the continuing need for more NPOs, the travel requirements each week can be daunting. During the semester, students meet with the NPOs each week. It is desirable for the instructor to attend the meetings as an observer to monitor requirement requests of the client, and commitments of the student team. If the number of NPO sites, and the travel constraints make professor attendance improbable, it is important to have weekly discussions between

the instructor and student teams to affirm the ability to deliver on commitments.

Another difficulty in the class coordination is the transition from student to employee. In the academic environment, all class projects are designed and tested to meet with success if completed correctly. In the corporate environment, theory and reality may be divergent paths. As such, students initially are frustrated, and recurrently in the professor's office asking for assistance. It is not the role of a project manager (the professor's role at this point) to "take care of" employees. As such, the professor needs to direct the students toward solving problems on their own, as a team. It's a learning process for the students, thus the professor needs to appreciate the difficulty to the students. Only if there is a major problem with the project, such as the NPO not working with the students, should the professor actively get involved on the project.

Managing Student Teams

In managing student teams, the following are a few lessons we have learned. (1) Students underestimate time required for projects. Having students determine project specifications, use project management software with a Gantt chart with short deadlines, and continuously updating the chart throughout the semester, often saves project from failure later in the cycle. (2) Student success in academia involves individual achievement. In industry, these projects involve close teamwork and it is often difficult for students to adapt. The use of collaboration software to manage projects and develop team skills is imperative. (3) Require students to monitor projects and update the NPOs via on-site weekly status reports/visits, which list what has been completed, what is to be completed, and difficulties encountered. This trains the students to stay focused and be responsible. (4) Team members need to hold each other accountable in posting accurate weekly progress updates that are not inflated or overstated. This can be accomplished with interaction/postings between the professor and group, using a groupware/collaboration tool.

Working with NPOs

Utilizing NPOs in capstone projects offers many benefits to the community as documented earlier in this paper, however there are challenges that must be addressed. First, many

NPOs use volunteers for internal IT support, often with questionable results. Many IT "advisors" are out of the IT field, or self-proclaimed "experts". Changing NPO support can also lead to changing IT direction, which can be confusing or frustrating to the students. As a result, students learn to provide advice, and educate the NPO on the use of technology standards and protocols.

NPOs with limited budgets, frequently solicit universities for hardware or software donations. Without funding for such donations, it often leaves the university looking to obtain funding and hardware donations from other sources, outside the university. Often this could be in conflict with other fundraising efforts of the university, and a standard policy statement must be created prior to working with NPOs to avoid miscommunication with potential clients.

Software licensing issues can be educational for NPOs. Many NPOs do not understand licensing models, and explaining them is often difficult for students, as well as purchasing necessary software with limited financial resources. In addition to software licensing, application support is also an issue. While NPOs sign agreements to eliminate recourse against the university and students, and limit time frame commitments, many NPOs expect ongoing "tech support" from the professor after the project is completed. This is essential in developing a supply of further projects from that NPO, as well as for good recommendations to other NPOs that may be under consideration. Therefore, this additional effort needs to be recognized as part of the professor's workload.

Each NPO should be contacted each week, to maintain a dialog of the student team's progress. While on site meetings are preferred, a phone meeting can be substituted. Open communication and trust is essential to keep the projects moving and understand difficulties that will arise on either side, during the semester,

Finding good NPO projects that are suitable for the student teams is difficult. The projects should be complex enough that they need an adequate number of hours of work for a student team of 4 during a semester. Combining smaller projects into a larger more complex, or limiting overly ambitious projects is necessary for the Professor to manage before the semester begins. Further, obtaining a strong commitment from the NPO to work with the students the

entire semester is critical for the project's success

Finalizing the Project

In the beginning of the project, the students are required to define specifications for the project, develop a timeline to visually define the weekly progress of the project and complete the agreed task. Nearly every project starts off slow as the teams usually believe they have much more time than they realize. Near the end, teams begin to "negotiate" with professors about "reducing the project" to enable completion. Rarely is a team on, or ahead of schedule, in the final 3 weeks. As a capstone class, all are seniors, anxious to graduate. By being very clear and consistent that without completion of the project, all team members will receive an "incomplete" on the project, and graduation is put off a semester, and the team members develop a commitment to complete the project on time. The amount of work that is completed in the final 3 weeks might be compared to the frenzied rush to complete a project delivery in industry.

Teams should be expected to produce a detailed user's manual for the project. Detailed instructions on each part of the project, with troubleshooting guides, should be included in the manual. By producing the manual, students gain insight into what steps are actually completed, rather than assuming the end user's have the same background knowledge that the students, trained in this field, have. The completion of the manual is critical for training the NPO on the use of the software, network, backups, web site, etc. that the students have completed. During a training session for employees, the manual should be given the employees to ensure they are comfortable with what they are learning, and they can follow it in the manual for future use. In addition to the manual, many teams develop a "quick start" guide of commonly used tasks that is this printed to assist the NPO personnel with rapid information, while not overwhelmed by the manual.

Delivery of the project

When the project is completed, the teams are expected to give a final presentation to the NPO. It is valuable if all the people from the NPO that worked with the students would be able to attend this presentation. This should be a business "formal" appearance, delivered in a University presentation room, with a PowerPoint presentation, and demonstrations of the project (if possible). This should be a one-hour presentation. Each student should present or demonstrate the part of the project they were responsible for. Included in the presentation would be initial problems presented by the NPO, specifications of the project(s), brief summary of the different modules completed, difficulties experienced throughout the semester, and, finally, suggestions on where to go from here. The future suggestions are often appreciated by the NPOs. Most importantly for the professor, it frequently leads to more projects in the future.

Final evaluation / Final deliverables

When the presentation is over, the NPO should be expected to complete a questionnaire about the project deliverable, professionalism of the students, suggestions for the future enhancements, and ideas for further projects or other NPOs in the future. When the questionnaire is completed, a CD/DVD should be delivered with copies of all source code developed by the students, PDF versions of all manual and quick start guides, and a copy of the PowerPoint that was given for the final presentation. Additionally, a printed and bound version of the manual should be delivered along with a digital copy.

4. CONCLUSION

An analysis of nearly 100 projects over the past 10 years shows much success when compiling the data from the NPOs. End of the semester questionnaires completed by the NPO Executive Directors were carefully evaluated and scrutinized to obtain insight into program, projects and overall satisfaction.

With careful planning and well-defined requirements, community-based capstone projects provide many benefits for computing students, and help develop university/industry relationships. In general, students enjoy working for an NPO and demonstrated a willingness to contribute more effort to the course then in a traditional project course. Students received a more in-depth exposure to, and understanding of IS concepts. In the process, they developed technical consulting skills and community contact resources. The NPOs received working software applications that solved specific needs. Students developed an expanded portfolio

including evidence of the work they are capable of performing and with a new sense of commitment to their role in society. These NPO projects supported collaboration between the University and the local community, complimented the University's public relations goals, and helped identify additional projects or grant opportunities. We have used an approach to the information systems capstone project that improves the curriculum, University image in the community, and success of the student. Institutions that form relationships with community clients in need of information systems help will recognize benefits for students, community partners, and the institution.

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