Diversifying WPI Projects in Switzerland

An Interactive Qualifying Project
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Abstract

Worcester Polytechnic Institute's Interactive Qualifying Project challenges students to address problems at the intersection of society and technology. Our project was to diversify student opportunities at the Global Projects Program's new project center in Switzerland by recommending new project partners and developing tools and strategies for growth. By meeting WPI alumni, we learned how the IQP could grow in Switzerland. We also created an annotated bibliography and summary of IQP literature, demonstrating the impact of a global experience on engineering education.

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CHAPTER 1: Introduction

Engineers and scientists have an important role in the community as developers of society's technologies. As the use of technology becomes more widespread it has become increasingly important for engineers to be able to "bridge the gap" between their technical solutions and the people who use them (Lima & Oakes, 2014, p. 105). In response to the "Science, Technology and Society" (STS) movement of the 1960s and '70s, universities began to develop programs to expose engineering students to their responsibilities to society (Schachterle & Watkins, 1992). Worcester Polytechnic Institute (WPI), a small technical university in central Massachusetts understood that the social context of engineering was an important aspect of earning an engineering degree. As part of the restructuring of the undergraduate curriculum in 1970, WPI introduced three project-based graduation requirements. The Humanities and Arts project gives students the opportunity to explore an interest in a variety of topics outside of engineering, such as art, music, history, literature, or language. The Major Qualifying Project (MQP) serves as a technical capstone in the student's major. The third project, a project exposing technical students to social aspects of real-world problems (Vaz, 2012) was termed the Interactive Qualifying Project (IQP).

The IQP is designed to give students the opportunity to take part in a project where they are exposed to a real-world problem that is proposed by a sponsoring organization. Due to the inherent social qualities of the IQP, nonprofit organizations (NPO) and government agencies are popular project sponsors. To give students a global perspective, the Global Projects Program (GPP) allows students to complete their project requirements at WPI or at one of more than forty project centers around the world. One of the newest project centers is located in Switzerland. Opened in 2013, the Switzerland Project Center has worked closely with many local universities on a variety of interesting IQPs. However, projects sponsored by universities tend to be research-based and the program would benefit from diversifying the projects to expand beyond the university setting. In this way, students would receive a more "out of their element" experience while being able to work closely with the community.

The Switzerland Project Center is currently going through a growth period to find new types of sponsoring organizations. Each project center uses different strategies to find sponsors based on the culture of the specific location and the connections of the center director. Historically, many project center directors find sponsors through their personal contacts, WPI alumni, or recommendations from previous sponsors. Due to the diversity of the project centers, different

types of projects are done with a variety of sponsors in different locations. For example, many of the projects completed in Cape Town, South Africa pertain to community development, while projects in London, England are often with museums. The Switzerland Project Center needs to find its niche in Swiss society in order to determine the best types of organizations with which to work.

Switzerland is home to many nonprofit and nongovernmental organizations as well as companies in a variety of sectors, which may serve as good sponsors for future IQPs. There is research about both Swiss organizations and the Interactive Qualifying Project; however, there is a lack of research in regards to how the concept of the IQP will fit into the structure of Swiss organizations. A group of WPI students completed a feasibility study in 2013 designed to discover whether or not Switzerland was a good location for a WPI project center. The group identified five key sectors in Swiss society that made Switzerland a viable project site. These sectors include: academia, industry, finance, pharmaceuticals, and sports (Bansal, Isenhart, & Meagher, 2013, p. 57). Although these are five sectors that are important to Swiss society, they are not necessarily best suited for IQP because they do not fully represent the scope of organizations that Switzerland has to offer.

An important component of this project was to determine what types of organizations would be interested in working with WPI students on future IQPs. It was important for us to determine how the IQP can benefit different types of organizations. We aimed to find potential sponsors outside of academia in NPOs, government agencies, and industry. After meeting with WPI alumni and past IQP sponsors, we compiled our ideas and formed recommendations to grow the Switzerland Project Center. Throughout our project, we created marketing materials, a guide for project sponsors, and a reproducible strategy for growing a project center.

This report contains information about the history of the global initiatives at WPI and serves as an information guide to the fluidity of the project-based education undertaken at WPI. There is a special emphasis placed on the IQP and its development. While conducting the research necessary to understand the history and development of the IQP, we have found that there is no central location to obtain literature that has been written about the IQP, the Interdisciplinary and Global Studies Division (IGSD), and Global Projects Program and their relationships and development both individually, and together as an integral part of WPI's curriculum. We have created an annotated bibliography to serve as a central location for relevant literature to be useful for us in the

execution of our project and others seeking to understand more about the project-based curriculum of WPI.

The development of the Switzerland Project Center is important to WPI, as well as Swiss organizations where WPI groups will work. As one of WPI's project centers around the world, the Switzerland Project Center provides new opportunities for the development of global engineers. These projects are mutually beneficial as WPI students help organizations address issues at the intersection of science and technology and human needs and experience personal growth and professional development.

CHAPTER 2: Background

In order to fully understand the Interactive Qualifying Project (IQP) and how it can be adapted to fit Swiss culture, we must first look at the origins of the IQP, from the implementation of the WPI Plan to the widely spread program it has become today. We will explore how the IQP is distinctive from other types of off-campus learning and how it has evolved since the start of the Global Projects Program (GPP). As the GPP has grown, the definition of the IQP has evolved, even though the formal academic objectives of the IQP have largely remained the same. However, the focus has grown to include a cultural and global dimension as over sixty percent of WPI students are now completing their IQPs off-campus.

Following the exploration of how the IQP has been implemented in many different countries, we will visit the Switzerland Project Center. We will look at Switzerland in the light of the development of other project centers to learn what we can from their experiences. Since the Switzerland Project Center is in the process of expanding the scope of IQPs offered, we will then look into the structure of different types of organizations in Switzerland that could be possible sponsors for future projects. Though nonprofits are a typical focus for IQPs, many projects are done with state and local governments, cultural institutions and companies in various industries as well. We will explain different opportunities that may exist in Switzerland with these different types of organizations. This will play a role in determining which types of sponsors may be interested in working with WPI.

2.1 Engineering Education Reform

Since the 1970s there has been a push for engineering universities to teach engineering students about the impact their future work will have on society (Schachterle and Watkins, 1992). More recently, in 2004 the Accreditation Board for Engineering and Technology (ABET) significantly modified their requirements by adding that students must receive "the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social context" (Vaz, 2005). The challenges engineers face increasingly involve social aspects in addition to the technical problems. As the world becomes more interconnected, it is important for engineers to have exposure to global education that will allow them to work and communicate around the world (Vaz, Mello, & DiBiasio, 2011, p.77).

Progress in giving students global experiences has been relatively slow as universities have been struggling to find a sustainable way to teach students about the global impacts of engineering solutions, and to prepare their students to participate in what has become an interconnected global society. Engineering students make up less than 5% of all US students receiving international experience (Vaz, Mello, & DiBiasio, 2011, p.77). The structure and requirements in typical engineering programs make involvement in global programs challenging. In many cases, global programs are offered during the summer, or via delayed graduation (DiBiasio and Mello, 2004, p.238). However, universities have been increasingly developing a wide range of programs that would give students global exposure.

2.2 Off-Campus Learning Programs

Universities have taken different approaches in giving students a global experience. Some programs are focused on volunteerism, while others are more geared toward academics or cultural immersion. These programs can be held on-campus, or anywhere around the world. Due to the interdisciplinary nature and variance of types of projects, the IQP does not fall distinctly into any mainstream categories that are described below. However, an overview of these programs is helpful in understanding how the IQP is similar and different to other programs.

Many universities provide programs which help students learn about the global and social impacts of their work while meeting some academic requirements. Engineering global programs typically fall into the following categories (Parkinson, 2007):

1. Dual Degree – student receives a degree from home university and one from abroad university. Typically seen in graduate study.
2. Exchange – Students take classes abroad in native language to fulfill home university degree requirements.
3. Extension – Home university holds courses abroad, taught in English by the faculty of the home university
4. Internship/Co-op – Students work for company abroad (US or Foreign).
5. Project Based Learning/Service Learning – Students are immersed in another culture via a project connecting society and technology
6. Research Abroad – Student conducts research internationally with guidance of faculty member.
7. Experiential Learning – Learning through experiences, or "learning by doing."

In a 2007 study by Alan Parkinson, it was found that most programs had less than fifty students participate every year. Purdue University has one of the larger programs where approximately 200 students participate in foreign exchange programs at various universities. Massachusetts Institute of Technology's program facilitates 200 students doing research and/or internships abroad. Overall, WPI's Global Projects Program was the largest listed and was noted as a leader in the project based service learning category, as well as a leader in the engineering study abroad field (Parkinson 2007).

2.2.1 Project Based Learning/Service Learning

Service learning is a partnership between educational institutions and the community in which students perform activities or projects which benefit others, while simultaneously fulfilling course-specific objectives. The contributions to the community are unpaid, but students can receive academic credit. Often service learning is performed in the form of a project, called project-based service learning, where students work on an open-ended problem. Project-based service learning can be done through off-campus experiences as well as in a classroom setting on campus. The Commission on National and Community Service lists some of the most important objectives of service learning as meeting the actual needs of the community, collaborating with community members, and using what has already been learned in the classroom in service work (Waterman, 2013, p. 2).

Service learning is explicitly different from volunteer service. While both volunteer work and service learning benefit the community, service learning has a special focus on education. As part of a traditional curriculum, students write, share, and reflect on their experiences serving the community (Waterman, 2013, p. 3). Students also experience personal development as they work with community members and learn about civil responsibilities.

Lima and Oakes (2013), outline service learning by breaking it into five components: service, academic content, partnerships and reciprocity, mutual learning, and reflection. Service and academic content are important aspects of service learning, but the partnerships and mutual learning aspects really distinguish service learning. The projects are a collaborative effort between the students, community, and faculty. The service work is done in a partnership with the community, rather than for the community. In this sense, both the students and the community members are learning and benefiting from the projects (Lima & Oakes, 2013).

The research component of service learning is unique in that students are often learning how to acquire their own data. Sometimes the information required for the projects is not available via traditional resources such as textbooks or websites. Students learn through service learning how to obtain the data they need, often by interviewing and surveying those with whom they are working (Lima & Oakes, 2013, p. 15).

Engineering students have been involved in service learning at the University of Massachusetts at Lowell. Senior Mechanical Engineering students worked with villages in Peru to give community members access to safe drinking water. The students completed this project as a capstone for their major area of study. They researched possible solutions, collaborated with the community to provide solutions, and learned how to overcome challenges (Lima & Oakes, 2013, p. 237).

Service learning is designed to be beneficial to both the local population and to the students. It is, however, difficult to find information regarding the impacts that students have made on the community (Jiusto & Vaz, 2015). Students benefit not only from the academic outcomes of the projects, but from having the opportunity to see how their work has helped others. Service learning gives students a chance to be proud of the work they accomplish and allows the community members to feel empowered by the results of the projects. It is also valuable for students to learn to work with people of different backgrounds, and how to show respect for different cultures (Lima & Oakes, 2013, p. 3).

The IQP is cited by some as an example of project-based service learning (Parkinson 2007), while others categorize the IQP as a combination of several types of programs. The definition of project-based service learning does not require that students work in small, interdisciplinary groups as does the IQP. Therefore, as the IQP may fall into the category of project-based service learning, the definition of project-based service learning does not fully describe the complexity of the IQP.

2.2.2 Civic Engagement

Civic engagement is defined as making a difference in the community and improving quality of life. According to a study done by the Association of American Colleges & Universities (AAC&U), "More than 70% of all college students report participating in some form of volunteering, community service or service learning during their time in college" (Finley, 2012, p. 2).

Examples of this involvement at WPI can be seen in projects performed at the Cape Town, South Africa project center. In Cape Town most projects entail heavy involvement of community members with students to maximize potential opportunities for improvements focusing largely on upgrading informal settlements with poor sanitation and other essential amenities.

One of the many instances of civic engagement programs at other American universities such as the Lindy Center for Civic Engagement established at Drexel University. Through this opportunity students are able to access a database filled with different civic engagement initiatives to fulfill university credits as a graduation requirement (Farman, 2011). The goals of these projects line up similarly to that of the IQP in that individuals are applying their knowledge to assist in social issues in a project setting. Simultaneously, the gaps in knowledge and skills both within the project team and the community or organization must be realized and accounted for in the action plan.

While civic engagement does not quite encompass the entirety of an IQP experience, there are certainly areas of overlap. In particular moving away from a structured, formal curriculum and offering an unscripted, open-ended curriculum fits the IQP very closely. With this crossover, a comparison can be made in describing the IQP to those unfamiliar with this practice but other key considerations, such as the surrounding social factors and global project scope, must be accounted for to establish a complete understanding of WPI's interdisciplinary program.

2.2.3 Experiential Learning

Experiential Learning offers students a learning opportunity fundamentally different from that of a traditional classroom situation. Experiential learning is both a learning and teaching philosophy in which educators engage with students outside of the classroom. Educators encourage students to cooperate rather than compete in situations where the experience includes the possibility of natural consequences, failures, mistakes, and successes ("Experiential Learning," n.d., p.1). Students are presented with learning objectives including critical thinking, writing, research, collaboration and the social and cultural aspects of the project (Jiusto & Vaz, 2015, p. 27-3). Students learn in a student- rather than instructor-centered environment through:

- **Doing:** What the student learns instead of quality or quantity of the experience
- **Sharing:** Relating what students discovered in past experiences with the mindset of application to future use

- **Processing:** Discuss themes, problems and issues that emerged and identification of recurring themes
- **Generalizing:** Identify "real-life" principles, trends and patterns that can be applied in "real-life" situations
- **Applying:** Students take what they learned and discuss how takeaways can be used in future situations of academics or during their careers ("Experiential Learning," n.d., p. 3).

During the experience, students bolster student-self, student-student, student-faculty and student-world relationships ("Experiential Learning," n.d., p. 8). Experiential Learning requires initiative, decision making and accountability for failures and successes.

For Experiential Learning to be successful, both the students and instructors must assume non-traditional roles compared to the classroom setting. Additionally, students must be willing to accept that situations will often be ill-defined and open-ended, leading to opportunities to make mistakes and learn from those mistakes. Students can expect freedom in their educational experience as long as they are learning and making progress ("Experiential Learning," n.d., p. 4). It is important to also be accepting of project outcomes that may simultaneously fall short of "systemic impact" and still provide a valuable learning experience for students, sponsors, and others (Jiusto & Vaz, 2015, p. 27-2).

Experiential Learning is often conducted abroad to further put the students "out of their element" (R. Vaz, personal communication, February 18, 2015). This causes students to think quickly and critically, leading to better life skills. WPI projects completed through the Global Projects Program fall into the category of Experiential Learning. The projects are open-ended and aim to encourage students' development of self-directed learning and life-long learning (Jiusto, DiBiasio, 2006, p.196)

2.2.4 The IQP in terms of other off-campus learning programs

The IQP shares many traits with both Service Learning and Experiential Learning in regards to expected outcomes and also accomplishes different goals than a traditional study abroad program. The fundamental goal of the IQP is to give students a broad understanding of the cultural and social contexts in the fields of engineering and science ("Interactive Qualifying Project," n.d.). The goal of service learning is to create a partnership between educational institutions and the community in which students perform activities or projects that benefit others, while also learning course-specific

objectives. Experiential Learning is a philosophy where educators engage with students outside of the classroom to subject students to a learning environment which allows for the possibility of natural consequences, failures, mistakes and successes ("Experiential Learning," n.d., p. 1). Studying abroad is defined as students taking courses at another university where the primary objective is to change the students' cultural outlook on society (Carrillo, 3).

Both Service Learning and Experiential Learning focus on providing students with real-world problems to solve outside of the context of a university classroom. The IQP also does this but furthermore seeks to emphasize the socioeconomic implications of various engineering and scientific solutions. The goals of the IQP are for students to improve critical and persuasive writing skills, oral communication and presentation skills and group and team dynamics in the context of solving a "real-world problem" (Jiusto & Vaz, 2015, p. 27-3) where the students are "out of their element" (R. Vaz, personal communication, February 18, 2015) in another social context. The IQP emphasizes the use of secondary sources (S. Jiusto, personal communication, February 19, 2015) whereas service learning emphasizes the student's collection and interpretation of their own data (Lima & Oakes, 2013, p. 15).

Service learning and the IQP both differ from the concept of volunteering. Oftentimes, the goal of volunteering is to build a product or service *for* a community. Service Learning and the IQP, in order to function effectively, require that the community be involved, i.e. working *with* the community. This ensures that the students and community mutually benefit from the collaboration.

Experiential Learning and the IQP both seek to emphasize ill-defined and open-ended problems to encourage the students to explore potential solutions on their own without direct guidance from their advisors. The IQP draws from the collaborative nature of Service Learning and Experiential Learning by placing the students outside of a university setting, giving them an open-ended problem and, letting the students take their own approach to find their own solutions.

2.3 History of WPI's Project-Based Curriculum

In the early 1970s WPI restructured its undergraduate curriculum through the institution of the WPI Plan. The WPI plan moved WPI from a traditional semester schedule to a quarter system and introduced a project-based curriculum. The seven week quarters that replaced the semesters allow for students to complete the required projects without extending their graduation date. The WPI Plan outlined three projects which became graduation requirements for students. In the early

years of the implementation of the WPI Plan, these projects evolved into the humanities and arts requirement, the Interactive Qualifying Project, and the Major Qualifying Project (MQP) (Durgin and Parrish, 1998, p.63).

The class of 1981 was the first class of WPI graduates to be required to complete an IQP. The Zwiebel Committee, chaired by Imre Zwiebel, defined the IQP. The committee wrote that by completing an IQP:

> Students would become sensitive to social problems, be able to question, criticize or reinforce prevailing ethics and values, be aware of societal-humanistic-technological interactions, and be able to make better judgments and policy recommendations on issues that affect society. In short, they would become better scientists and engineers. ("The Best Laid Plans," 1997)

Students now have the choice to complete any of the three projects at WPI or off-campus through WPI's Global Projects Program. In 1974, WPI opened its first residential project center in Washington, DC, where students could complete their IQP. Soon after, the first international center was opened in London. Since the development of the early project centers, the program has grown rapidly, now allowing students to choose from 39 locations in 25 countries. Students interested in completing their project off-campus must complete an application process and be accepted into the program.

The Global Projects Program was established as the Global Perspective Program in the late 1980s to support students completing their projects off-campus (Durgin and Parrish, 1998, p.64). Gaining a global perspective is achieved more thoroughly through traveling abroad rather than classroom learning (DiBiasio, Mello, & Carrera, 2004). Since the creation of the program, student involvement as well as the number of project center locations has increased rapidly.

2.4 Growth of the Global Projects Program

Over 10,000 WPI students have participated in the GPP over the past forty years (R.Vaz, personal communication, February 18, 2015). Figure 1, below, shows the dramatic growth of students completing their IQP through the Global Projects Program over the last six years, from 46% in the 2009-10 school year to 67% who will be participating in the program in the 2015-16 school year (WPI IGSD Statistics).

Program Year	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
IQP Applicants	488	536	577	571	686	688	859
Accepted IQP Students	357	423	439	476	570	609	745
Size of sophomore class	775	869	914	866	958	918	1066
% sophomores applied	63%	62%	63%	66%	72%	75%	81%
% placed	46%	49%	48%	55%	59%	66%	67%

Figure 1: IQP GPP Applicants/Placements 2009-2015

WPI is able to send such a high rate of students off-campus because the projects offered by the GPP are an integral part of WPI's curriculum (Vaz, 2012). Because IQPs completed through the GPP are finished in a single term, participation in the program does not extend the graduation time for participating students. Students complete their IQP full-time in a single term, thereby devoting all of their resources to focusing on their project, including the research, implementation, interactions, and report writing (Vaz, 2005). The GPP and IQP curriculum illustrate how WPI is able to put an opportunity for off-campus experience at the heart of an engineering education, rather than as an afterthought (Vaz, Mello, & DiBiasio, 2011, p.78). New project centers are opening frequently due to the surge of interest in the program. Figure 2, below, shows the rise of IQP project centers from the initial two (Washington DC and London, England) in 1974 to the 27 current project centers (WPI IGSD Statistics). Currently, WPI is looking to open another new project center in Ecuador, and a team will be completing a feasibility study in the fall of 2015.

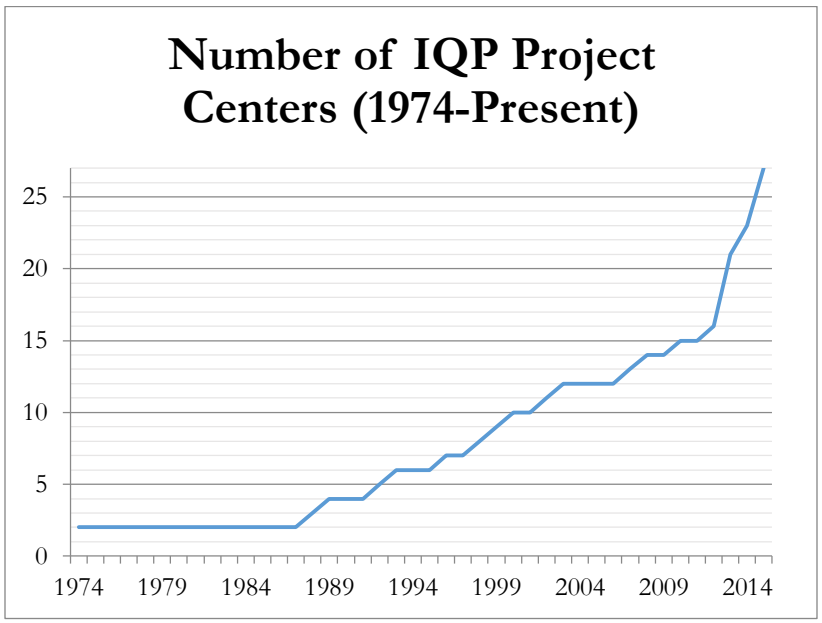

Figure 2: IQP Project Centers 1974-Present

2.5 The Interactive Qualifying Project

2.5.1 What is the IQP?

Richard Vaz, Natalie Mello and David DiBiasio describe the Interactive Qualifying Project as a combination of, "Project-based experiential learning, service learning, undergraduate research, and study abroad" (Vaz, Mello, DiBiasio, 2011, p.78). This unique combination of several types of global programs has been defined by Jiusto, McCauley and Stephens as Shared Action Learning (SAL). Shared Action Learning is the collaborative learning that takes place when students, community members, and faculty work together on sustainability projects. Although many projects are done off-campus and internationally, the concept of Shared Action Learning is applicable on-campus as well as abroad (Jiusto, McCauley, & Stephens, 2013, p.1).

The Interactive Qualifying Project is a graduation requirement for all undergraduate students at WPI. The IQP is a group problem-solving project in which students receive general education credits and an understanding of the connections between science and technology and social problems (Jiusto & Vaz, 2015, p. 27-3). The IQP was established as part of the WPI Plan in 1970 with initial objectives, laid out as follows:

1. "To create an awareness of socially related technological interactions
2. To enable the identification of socio-technological systems, subsystems, and the linkages between them
3. To cultivate the habit of questioning social values and structures
4. To develop and integrate the skills of evaluation and analysis in the societal, humanistic, and technological disciplines
5. To provide methods for assessing the impact of technology on society and human welfare, and the impact of social systems on technological developments
6. To encourage the recommendation of policy."

The IQP is currently defined by its official learning objectives, which are noted below (Figure 3: IQP Learning Objectives). Although these learning objectives formally define the IQP, it is still challenging to describe the IQP. The Dean of Interdisciplinary and Global Studies Division (IGSD), Rick Vaz, explained in an interview that he finds it easier to describe the IQP by explaining what it is not (R. Vaz, personal communication, February 18, 2015). The IQP is not an internship, it is not a study abroad program, and it is not a community service project.

The faculty of WPI adopted the following learning objectives for the IQP in 2006 ("Interdisciplinary & Global Studies: IQP Learning Outcomes," 2006).

As the IQP became more streamlined over the years, WPI developed concrete learning outcomes for the projects. According to the faculty-approved learning outcomes, IQP students will:

1. Demonstrate an understanding of the project's technical, social and humanistic context.
2. Define clear, achievable goals and objectives for the project.
3. Critically identify, utilize, and properly cite information sources, and integrate information from multiple sources to identify appropriate approaches to addressing the project goals.
4. Select and implement a sound approach to solving an interdisciplinary problem.
5. Analyze and synthesize results from social, ethical, humanistic, technical or other perspectives, as appropriate.
6. Maintain effective working relationships within the project team and with the project advisor(s), recognizing and resolving problems that may arise.
7. Demonstrate the ability to write clearly, critically and persuasively.
8. Demonstrate strong oral communication skills, using appropriate, effective visual aids.
9. Demonstrate an awareness of the ethical dimensions of their project work.

Figure 3: IQP Learning Objectives

The complexity in the explanation of the IQP is intentional. Its open-ended nature allows it to be adapted to fit the societal needs of the locations of the projects. The needs of the community in, for example, Cape Town, South Africa differ from the needs of Zurich, Switzerland, or Worcester, Massachusetts. By having a flexible definition and open-ended outcomes, it is able to encompass both on-campus and off-campus projects. This complexity ensures that every IQP is different, allowing WPI to extend its outreach into as many locations, communities and problems as possible.

2.5.2 Stakeholders of the IQP

The real-world nature of the off-campus IQP results in the participation of three primary stakeholders: the students, the community, and WPI. The students, in addition to the aforementioned learning objectives, learn many life skills that they would not otherwise learn by staying on campus. If they are at one of the overseas project centers they receive experience being fully immersed in another culture, from their actual working environment to daily living. Though not an official learning objective, the students often have the opportunity to achieve some basic knowledge of a foreign language by spending seven weeks in another country. The students also gain experience spending more than forty hours per week working and living with their groups and

dealing with the challenges associated therewith. They also have the opportunity to have team dynamics discussions with their advisors. The advisors encourage the students to solve their own team issues, making students work better in groups and also bolstering students' confidence to raise issues to the entire team when they arise. This prepares them for after-graduation engineering work, which is seldom done alone. The students may also have an opportunity to experience the hurdles that come associated with working with individuals in the community of different cultural and linguistic backgrounds. Overcoming these hurdles gives students the opportunity to experience how the globalization of engineering is affecting both the profession and society.

The community also benefits from collaborating with WPI on Interactive Qualifying Projects. The organizations, proposing the topics themselves, have meaningful work done by their student groups, ensuring that Interactive Qualifying Projects continue to be beneficial to the communities in which they are performed. Many project centers continue to do projects with the same organization, year after year. This approach allows the organizations to count on having a team of WPI students working for their organization each year. These IQPs are able to build off of one another and WPI's role in that community is strengthened by many years of collaborative project work. Many organizations choose to collaborate with WPI to gain the international perspective that WPI students (many themselves being international) are able to bring to foreign countries.

WPI is able to benefit from having this network of over 25 IQP centers to send its students. Many students choose to attend WPI to have the opportunity to go abroad to complete their IQPs. The number of available project centers allows students to make the decision to go abroad in the beginning of their sophomore year. The off-campus IQP program is also seven weeks long as opposed to an entire semester (typically 15 weeks), like those found at other universities that do not use the quarter system. One of the reasons students choose not to go abroad at other universities is that the duration of the program is too long and they are reluctant to leave their families and friends back home (Hansen, 1995, p. 255). The seven week duration alleviates some of these concerns by decreasing the time that the students will be away from home. The shorter duration of the IQP compared to a traditional semester abroad reduces the cost for participating students as well (Carlson, 2007). The number of available locations to study abroad is also attractive to students. Some of WPI's GPP locations also have the advantage of being in developing countries where there would otherwise be no university to send students.

2.5.3 IQP through the Global Projects Program

Students have the choice to complete their project off-campus through the GPP or on-campus at WPI. When completed in conjunction with the GPP, the IQP gives students the opportunity to experience a different culture in a way that would be difficult to learn in a traditional learning environment. Through the combination of technology, society, and problem solving, students become better-rounded with useful experience in solving problems and working as a team. Students are better able to learn on their own, and therefore become better engineers and ultimately better people.

The projects are completed in small interdisciplinary groups of third-year students. WPI faculty members travel to the project center with the students and serve as advisors for the project teams. The project teams work toward solving open-ended problems proposed by local organizations. The local organization, or sponsor, by WPI's terminology, works with students in a client/consultant type relationship with the team as the consultant that provides specific recommendations at the end of the project (R. Vaz, personal communication, February 18, 2015). The collaboration between students and the local organization exposes students to a new culture and provides students an "out of their element" experience.

In order to prepare for traveling off-campus, students take a preparation course (called ID2050) at WPI for seven weeks in the term before the project. This preparation course involves research of the project topic, a formal project proposal, and basic cultural studies. Following the seven week preparation, the students are on-site working on the project for a seven week term. The total experience is equivalent to 4.5 courses, which equates to 13.5 credit hours (Jiusto and DiBiasio, 2006, p.196). WPI organizes the housing for the students, and the students pay their living and travel expenses while working on the project. However, they do not pay extra tuition, assuming their project is completed during the school year.

The sponsor has an important role in an IQP. The sponsor, after agreeing to a partnership with WPI, works with the WPI center director (a WPI faculty member responsible for running the project center) to draft a project description which identifies a need that the sponsor has and how a student project might fill that need. After review from the center director, the description is finalized and eventually students are assigned to the project. The students quickly contact the sponsor, and the sponsor provides guidance to keep the students on track. When the students are on-site, the sponsor provides the students a work space, and provides feedback and guidance as necessary. The

involvement of the sponsor is largely determined by the project and the sponsor's preferences, however a weekly meeting with the students and advisors is required. The students will present the sponsor with a final report, as well as any other deliverables, at the end of the project term. This final report will also fulfill the WPI learning objectives, and will be graded for academic credit by WPI advisors.

2.6 Starting and Growing a Project Center

In order to determine a successful way to grow the Switzerland Project Center, it is important to understand what methods other project centers have used to find sponsors. The Copenhagen, Denmark and London, England project sites were chosen to study due to their proximity to Switzerland. Both Copenhagen and London are similar to Switzerland in that they are developed countries with strong economies. Their needs may be similar to that of the Swiss, so it is possible that strategies used in Copenhagen and London will be applicable in Switzerland. We also chose to research Cape Town, South Africa in order to get a perspective of what the process of building a project center is like in a different part of the world.

2.6.1 Project center examples

Copenhagen, Denmark Project Center

The Copenhagen Project Center was founded in 1996 by Tom Thomsen and Peder Pedersen. The sponsors and direction of the center were largely determined by Professor Thomsen and Professor Pedersen. Professors Thomsen and Pedersen both are originally from Denmark and attended university there, so they had existing contacts and spoke the native language. The project sponsors and direction of the center grew from there, with many projects currently in the fields of bicycle traffic and helping people with vision impairments, as well as sustainability and waste management. The initial sponsors were personal contacts of Professors Pedersen and Thomsen and most new sponsors were found through recommendations from past sponsors (S. Taylor, personal communication, February 17, 2015). The Copenhagen Project Center grew in 2000 to include MQPs done in Electrical and Computer Engineering at a local university in Denmark. The current Interactive Qualifying Projects in Copenhagen are largely done in the multicultural district of Nørrebro. Many projects are done with small nonprofits or government agencies. The current Copenhagen Project Center Director, Professor Steven Taylor, found that one of the benefits of working with small organizations is that the projects are likely to be implemented (S. Taylor, personal communication, February 17, 2015).

Professor Taylor gave us some recommendations for the Switzerland Project Center based on his experiences. He uses executive summaries of past project centers to show potential sponsors the type of work done by IQP groups and then explains to sponsors that the groups of students cross many disciplines, and that the projects completed by the groups are not engineering projects but projects with social and societal components. He advised us that sponsors tend to be surprised by the amount of work that students complete during the project (S. Taylor, personal communication, February 17, 2015).

Professor Taylor suggested that we utilize the alumni network to find some well-connected contacts in the Zurich area. He described how many project centers have a local liaison who helps make contact and provide knowledge of the community. Some of the concerns that potential sponsors have is their lack of physical space for the group and their ability to spend enough time supervising the group (S. Taylor, personal communication, February 17, 2015).

Although the countries of Denmark and Switzerland share similarities as they are both well developed countries with a high quality of life, the methods for growth between the project centers will differ. This is because the majority of contacts for the Switzerland Project Center will not come from personal connections of the center director. However, many of the suggestions that Professor Taylor shared will be useful in continuing to grow IQPs in Switzerland.

London, England Project Center

The London Project Center was formed from a former exchange program between WPI and the City University of London in 1974 (Schachterle & Watkins, 1992). In 1986, the exchange program morphed into an IQP project center, where students would work with partners from British agencies to fulfil their IQP requirement. London was the first international project center, and the second off-campus site, following Washington D.C. Before students went to London for the first time, WPI faculty started to develop professional contacts for the IQPs. They had a meeting with fifteen potential sponsoring organizations, fourteen of which were British. The fifteenth was a branch of the American Embassy, who did not think the British would understand the concept of student project work. However, every organization showed interest and the London project center was born (Schachterle & Watkins, 1992). These contacts came primarily from the relationship of Professor Lance Schachterle from WPI and Professor Maria Watkins from the City University of London, which was the foundation for the London Project Center. After preparation in the newly formed ID 2050 class, the first four teams of students completed projects with sponsors including

the Worshipful Company of Scientific Instrument Makers, the Institute of Electrical and Electronics Engineers Archive section, City University, and the UK Patent Office (Zeugner, personal communication, 2015).

After completion of the first set of projects, the sponsors were happy with the work completed and were eager to continue the relationship with WPI (Schachterle & Watkins, 1992). The initial sponsor set expanded when other organizations expressed interest in becoming sponsors. This was done through their attendance at the oral presentations at the conclusion of the projects, and others heard about the projects through word of mouth and other means. In 1988, the program increased to five projects per term, and shortly thereafter it had so much sponsor interest that a second term of projects was added.

The current program at the London Project Center has many projects varying in topics, with notably many museum and local government sponsors. However, they still need methods of attracting sponsors. A team of students at the London Project Center in 2011 did a similar project to ours which was aimed at producing marketing materials for the London Project Center to attract potential sponsors and future students (Aziz-Azizi, Casola, Huynh, & Talbot, 2011). They interviewed many professors at WPI to see how a website would be most effective, and then interviewed current sponsors in London to see what they are looking for in marketing materials to attract new sponsors. Their interview notes highlighted many key points that attract sponsors or that sponsors would want to know even before considering the sponsorship opportunity.

The top point that sponsors want to know was what the sponsor has to contribute to the project. The students wanted prospective sponsors to know that the project sponsorship comes with free, high quality work for a two month preparation phase and a two month implementation phase. They also mentioned that an important piece of information that they did not know beforehand was that the students come well prepared, having done much background research before arriving on site, and that they required minimal supervision on their part while working; the professors who were advising contributed in providing supervision.

The students found that personal referrals and face to face contact between past and potential sponsors were important (Aziz-Azizi et al., 2011). They learned that potential sponsors may not have time to do research on their own, and they do not know anything about WPI without doing that research. The potential sponsors are not confident in WPI, having not dealt with them before, and they need personal assurance in order to feel confident that sponsorship is a good move

for their organization. Consequently, face to face meetings and assurance would be invaluable in attracting potential sponsors.

These methods used by the London Project Center could be useful in diversifying the projects in Switzerland, because like Switzerland, the London project center grew out of a relationship with a university partner. Another interesting point is that there was an active exchange program with ETH in Zurich at the same time as the London Exchange program in 1974 (Schachterle & Watkins, 1992). Although some IQPs were done there in the late 1990s and early 2000s, it was not a fully developed project center until today. An investigation into the cause and history of WPI's presence in Switzerland would be an interesting endeavor, but there is not much material available on the subject.

Cape Town, South Africa Project Center

The Cape Town Project Centre (CTPC) was started in 2007 by Professor Scott Jiusto. The number of students that wanted to participate in off-campus projects exceeded the current capacity of the project centers. The need arose for another project center. After a preliminary feasibility investigation and without any contacts in Cape Town, he found a local coordinator who would help organize initial contacts and meetings for a small stipend. The first year the project center was up and running, there were six projects serving as a foundation and introduction for the project center into the issues and opportunities surrounding the community and informal settlement upgrading (housing, transportation, local economy, and disaster management) (Cape Town Project Center, 2007). In order to make a greater impact on the community all of the projects were done in one community the following year. These projects were all with the same sponsors, two women who wanted to improve their village. The focus of the project center became directed towards its mission: Upgrading informal settlements and helping poor communities. Focusing on the project center's mission addresses the inherent social aspect of the IQP, solving real-world problems with emphasis on their social aspects. This led the CTPC to develop a theme: Find sponsors whose proposed projects help lift up the informal settlements (i.e. slums) and other poor areas that surround Cape Town. Sponsoring organizations were primarily found through word of mouth through past sponsors relaying their experiences and results collaborating with WPI to their colleagues. When word of mouth did not suffice, Professor Jiusto used cold calls with some success. The nature of the types of organizations present in Cape Town fit well with the nature of IQPs. Small organizations in developing countries can benefit greatly from having a team of four students coming to help them,

free of charge to the sponsor if the demands placed on small organizations' staff are not too great (Scott Jiusto, personal communication, 2015). It was also discovered that many people did speak English even though South Africa has more than eleven national languages.

The Switzerland Project Center is currently in a different position than South Africa in regards to the size and types of sponsors. Switzerland has not had trouble with having enough sponsors, but rather diversifying the types of sponsors. It seems reasonable that the same techniques that were used in South Africa can be applied to Switzerland using existing sponsors and their contacts. Having a local coordinator is a tactic that is used in some project centers and could also be used in Switzerland. The local coordinator may be especially helpful when there is a higher language barrier between WPI and the sponsoring organization.

2.6.2 WPI Switzerland Project Center history

WPI's relationship with Switzerland started as an exchange program with ETH Zurich in 1974. This exchange program was managed by Professor Wilhelm Eggimann and continued at least until 1978. The relationship of WPI to Switzerland remains unclear from then until 2000, when one student did an independent IQP in E-term of 2000 with ETH-Zurich on Swiss Nuclear Power.

In 2001, Professor Gregory Theyel of WPI began an IQP Project Center based in Zurich. The first group of projects was done in D-term of 2001 and the project center then switched to B-term and held projects in B-term of 2001, 2002 and 2003. Although the project center was only active for four cycles of students, the students completed a variety of interesting projects. Projects ranged from deciding where to place webcams in the Alps, to analyzing the risk of fire in Fällanden. A table that shows the projects, terms, sponsors and locations of the projects done during this time period is below.

Project Term	Project Title	Sponsor	Location
D 2001	Assessment of the Policies and Regulations that Control Bovine Spongiform Encephalopathy in Switzerland	Swiss Federal Veterinary Office	Bern (?)
D 2001	Fire Incidence in the Town of Greifensee	Greifensee Fire Brigade	Greifensee
D 2001	The Effects of Changes in Alpine Land Use on Avalanche Activity	Swiss Federal Institute for Snow and Avalanche Research	Davos

B 2001	Experience the Mountains of Switzerland	Swiss Federal Institute for Snow and Avalanche Research	Davos
B 2001	Status of Animals in Swiss and American Society Using Canis Familiaris as a Model	Stiftung für das Wohl des Hundes	Widen
B 2001	Risk Amplification of GMOs in Europe	Syngenta Corporation	Basel
B 2002	Perceived and Actual Risks in the Gemiende Fällanden	Fällanden Fire Brigade	Fällanden
B 2002	Determining Significant Swiss Industrial Sites	?	?
B 2003	Analysis of Dog Training in Switzerland	Stiftung für das Wohl des Hundes	Widen
B 2003	Project Proposal for: WPI Technology Assessment and Transfer	Swiss Federal Institute for Snow and Avalanche Research	Davos

Although the projects were not all completed in Zurich, the students all lived in Zurich and commuted when needed to their project sponsors. Many of the details of this iteration of the project center are still unknown. However, the sponsors were a variety of different organizations, including federal government (i.e. Swiss Federal Institute for Snow and Avalanche Research), local municipalities (i.e. Fire Brigades), non-profits (i.e. Stiftung für das Wohl des Hundes) and industrial companies (i.e. Dow Chemical Company). The project center was shut down after 2003 and did not appear in the next year's WPI catalog as an off-campus project center. Little information is available on why the project center opened and closed, although this could possibly give an insight into what difficulties the Switzerland Project Center is currently encountering.

The Switzerland Project Center was restarted in 2013 after Switzerland was named one of the top prospects for new project centers in order to diversify projects by Dean Karen Oates, and to avoid overburdening existing project centers due to the influx of student interest. The first projects completed in 2013 were a Feasibility Study and a project with the Zurich University of Applied Science. The project center name was recently changed from the Zurich Project Center to the Switzerland Project Center in order to open the base of project sites to all of Switzerland, and possibly in the future, to more of Europe.

Switzerland was chosen as a site for a new project center due to its hub of biology and biotechnology research, and because of the close proximity to a large number of WPI alumni who would be invaluable in starting a new project center (Bansal, Isenhart, & Meagher, 2013). Some alumni are now currently project sponsors and contact points for future project sponsors. The sponsors for the Switzerland Project Center are predominately university sponsors, with one project being sponsored by an alumnus at Credit Suisse.

2.7 Sponsoring Organizations

Throughout different project locations, a variety of types of organizations (e.g. NPOs, NGOs, universities companies and government agencies) sponsor IQPs. In Copenhagen, for example, many of the projects are sponsored by nonprofit organizations while in London, England, several are sponsored by museums and local municipal governments. In the first two years of the Switzerland Project Center, the majority of projects have been sponsored by universities. According to an article by Hansen projects sponsored by nonprofit organizations, government agencies, or companies (rather than universities) are typically more successful than projects sponsored by foreign universities. In the university setting, professors sometimes struggle to move away from the traditional student-professor relationship. This can deter students from taking responsibility and initiative for their projects. Independent organizations typically treat students as interns and colleagues, giving the student groups more collective responsibility and are more focused on real-world problems (1995).

2.7.1 Nonprofit organizations

Nonprofit organizations (NPOs) are a potential source for sponsors for future IQPs in Switzerland. Many project centers work with sponsors in the nonprofit sector, and this section will explore if that is feasible in Switzerland.

History of Swiss government's involvement in social issues

Switzerland was founded on the premise of small federal government. The federal government tends to take a hands-off approach to dealing with social issues. The main social problems that the government takes responsibility for are the defense of the country, foreign policy, as well as Switzerland's currency (Nollert & Budowski, 2009). All other social issues tend to be handled by nonprofit organizations or smaller regional governments.

Prevalence of nonprofits in Switzerland

Because of this hands-off approach, the role of NPOs in Switzerland is greater than that in many other countries. NPOs take on the responsibilities that federal governments typically do in other countries. The federal government is supportive of NPOs because government relies so heavily on the nonprofits. It is difficult to determine exactly why Switzerland has this pass through budget, but based on the culture of having small federal government, it is likely that they do this in order to give more control to the cantons and the small organizations that are closer to the people and may be able to serve the people more efficiently. The reasons for the pass through budget will be further explored in Switzerland. This reliance on NPOs has resulted in the creation of over 100,000 associations. Associations are the most common type of nonprofit in Switzerland. Associations differ from other types of nonprofits such as foundations in that they provide services for the community, where foundations only provide funding and resources. Associations tend to be geared toward social and cultural issues (Nollert & Budowski, 2009).

Relationship between Swiss government and nonprofit organizations

The Swiss government supports many of these associations financially, most commonly through service agreements. Service agreements provide the NPOs with the funding and resources they need, and provide the population with important services. These subsidies are so common, that they actually make up over half of the entire Swiss budget (Nollert & Budowski, 2009). In this sense, the government is indirectly providing the services that some federal governments typically provide.

Most of the political parties in Switzerland have a positive opinion of nonprofits, with the most supportive party being the Liberal-Democratic party. However, the Swiss People's Party has the most critical attitude toward NPOs. Recently, as the Swiss People's Party has become more popular, this critical viewpoint of NPOs has become more prevalent in Switzerland. The Swiss People's Party sees some nonprofits as unnecessary, and is skeptical of the efficiency of the organizations (Nollert & Budowski, 2009). Historically, Switzerland has not had any formal policies toward monitoring the efficiency of the spending of the nonprofits, and the Swiss People's Party is interested in seeing stricter regulations put in place and reducing the subsidies that the NPOs receive.

Swiss population's attitude toward volunteerism and charity

The Swiss people are also supportive of the nonprofit organizations. According to the World Giving Index, which is compiled by the Charities Aid Foundation, Switzerland ranked 5th in the

world for its charitable giving, and 2nd in Europe. This ranking is calculated based on an average of three statistics: the percentage of citizens that donate money, the percentage of citizens that volunteered for an organization in the past month, and the percentage of citizens who have helped a stranger in the past month (Ramesh, 2010). In addition to being ranked 2nd in Europe for their charitable giving, the citizens of Switzerland donated an estimated 1.3 billion francs in 2011 (Cole, 2012).

Not only do the Swiss support NPOs financially, but they also volunteer for the organizations. A study was done by the Federal Statistical Office (in Switzerland) and the Swiss Non-Profit Society in 2011 of the volunteerism that took place in Switzerland in 2010. It was found that 33% of the population of Switzerland volunteered for a formal organization in 2010 (ages 15+). This is in comparison to just 25.4% of the population of the United States that volunteered in 2013 (ages 16+). Formal volunteering in Switzerland is defined as unpaid volunteering for an organization, typically sports associations, cultural associations, social-charitable organizations, or church institutions ("Volunteering in Switzerland," 2011). In Switzerland, sports associations are the most popular type of organization to volunteer for both for men and women ("Industry & Services Panorama," 2010). Volunteering for sports associations is common in other countries as well. The United States Department of Labor reported that in 2014 over 9% of the men who performed volunteer work volunteered for sports associations as coaches or referees ("Volunteering in the United States", 2014). For men in the United States, coaching or refereeing sports is the second most popular type of volunteering ("Volunteering in the United States," 2014).

Support for NPOs by region

It is also found that the German regions of Switzerland volunteer at a greater rate than the other regions ("Volunteering in Switzerland," 2011). The table below outlines the volunteer work that occurs in the different types of communities. The right side of the table shows the formal voluntary work that takes place in Switzerland. Formal voluntary work means working for an organization without pay, while informal voluntary work is helping friends or neighbors. The formal voluntary work is the data that is applicable to our project, as the IQPs would be done with formal organizations.

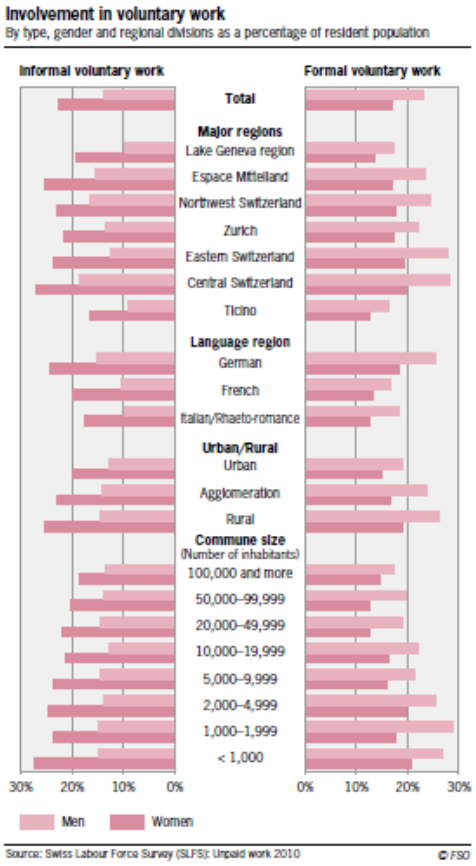

Figure 4: Volunteering in Switzerland

2.7.2 Industry

Many Interactive Qualifying Projects at other project centers have worked with industry partners in order to collaborate with private companies to work toward solving problems which they might not have the time or resources to address. These private companies sometimes pay a project fee which helps WPI or the students cover some of their expenses. In some instances, companies are saving money by working with WPI students rather than hiring a consulting company. In this sense, some companies are willing to pay a fee to WPI rather than hiring an outside company (R. Vaz, personal communication, February 18, 2015).

When thinking of industry in Switzerland, large companies like Lindt Chocolate and Nestlé may come to mind. However, 99.6% of businesses in Switzerland are categorized as either being small or medium in size ("Industry," 2014). The average size of these small businesses is only eleven employees ("Volunteering in Switzerland," 2011). These small companies may have needs for WPI student groups.

There are several sectors of industry in Switzerland that are prominent. The largest manufacturing sector in Switzerland is electrical and mechanical engineering ("Internationally Successful," n.d.). The majority of these are small engineering firms that are very focused to a specific product. This sector may be specifically appealing to WPI students who may interested in working with engineering companies, however it also provides a challenge in that not all students in the project teams are WPI students or have engineering backgrounds.

In addition to engineering companies, Switzerland is known for its pharmaceutical, watch-making, and technology industries. Basel, just West of Zurich is home to two large Swiss pharmaceutical companies, Novartis and Roche. The chemical and pharmaceutical industry is one of the fasting growing industries in Switzerland ("Volunteering in Switzerland," 2011). Switzerland, being the inventor of the quartz watch, is home to many small watch making companies, many located in Geneva ("Industry," 2014).

The graphic below, which is produced by the Swiss Customs Administration (FCA) shows the products that Switzerland exports.

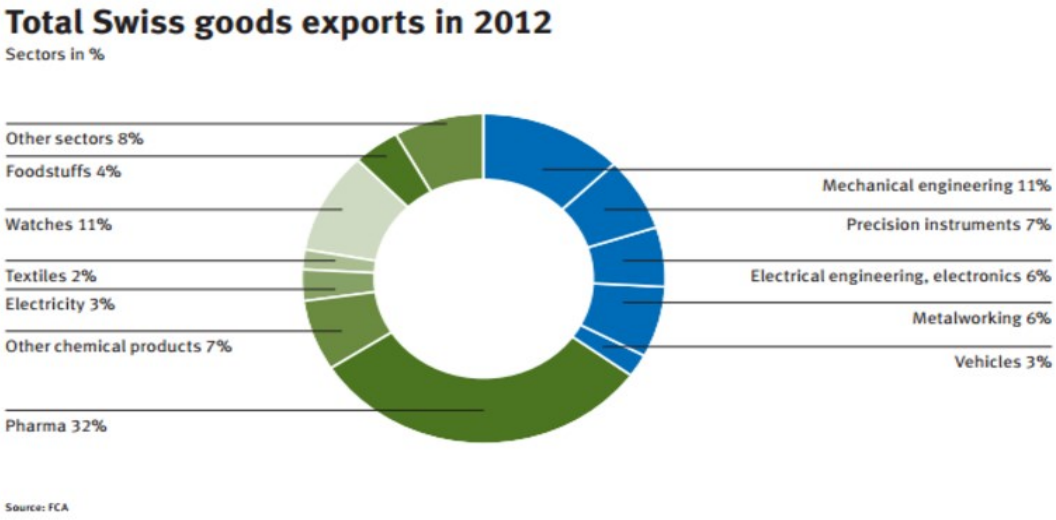

Figure 5: Swiss Export Breakdown

2.7.3 Non-Government Organizations

Due to the Swiss Federal government's use of a transfer budget, non-government organizations (NGOs) are typical end-users of Swiss federal funds. NGOs as defined in Switzerland are: "Independent institutions created under national private law. It is non-profit and pursues goals of international public utility in at least 2 countries." ("NGO Service," n.d.). Thus, NGOs are typically involved in international relationships and human rights.

A lot of Switzerland's NGOs are headquartered around Geneva due to its stance as a financial center and a center for diplomacy and international cooperation. Geneva is home to offices of the United Nations, World Health Organization and the Red Cross. Geneva is the city with the highest number of international organizations in the world. Potential sponsors for future projects may be furthering the diplomatic and human-rights interests of these organizations.

Some NGOs in Switzerland include: The Gesellschaft für bedrohte Völker (Society for Threatened Peoples, GfbV) specializes in strengthening workers' rights of local and indigenous peoples in Tibet, Malasia, Brazil, Indonesia and Switzerland. Their main priorities are the struggles against impunity of employers, the ramifications of the mining of raw materials by indigenous people in different regions of the world such as Chechnya, Sri Lanka, Iran, Iraq, Turkey and China. The GfbV is also focused on stopping the genocide and disenfranchisement of indigenous people and what Switzerland's role is in stopping these atrocities ("NGO Service," n.d.). Other organizations in the Swiss NGO human rights working group are: the Swiss Refugee Council, the Swiss Peace Council, Swiss Peace Foundation and the Association for the Prevention of Torture. Because most of the work of these organizations is done through volunteers, it stands to reason that there would be mutual benefit of the organizations, WPI and WPI students in furthering the missions of these organizations.

In addition to domestic Swiss industry, Switzerland is also the home to many international organizations. The European headquarters of the United Nations is located in Geneva, Switzerland. Switzerland is known for striving toward reaching consensus in its own government, so it is fitting to be the home of the United Nations. The United Nations and the NGOs that are associated with it may be a valuable potential sponsor to investigate. Large, well known organizations may be of interest to WPI students completing their project.

The International Red Cross is also headquartered in Geneva, Switzerland. The Red Cross was founded in 1863 in Switzerland, and even today the board of the Red Cross is made up of Swiss

citizens. The Red Cross may be a natural fit for the IQP, as much of their work is done through volunteers. In the same way as the United Nations, the Red Cross would offer students the privilege of working with a well-known international organization ("The Red Cross," n.d.).

2.7.4 Federal Government

The levels of government spending in Switzerland and the United States are very similar. In Fiscal Year 2014, the United States federal spending totaled 35% of GDP (Shantill, 2014) while in Switzerland, the spending by all levels of government was 34%. Swiss law mandates that all resources be allocated in such a way that provides the greatest benefit to the people. For this purpose, Switzerland uses a market oriented system, seeking multiple options for the allocation of funds. Market products are to be distributed to the citizens in a "socially fair" way (the word fair is subject to considerable debate among the Swiss citizens and parliament). The federal budget's primary purpose is to stabilize the economy, therefore the government is expected to save resources during economically strong times and spend money to boost the economy during downturns.

The Swiss government spends only 20.5% of the budget on federal operating costs. The confederation spends 74.8% of the budget as a "transfer budget", merely transferring the funds to the cantons and NPOs to conduct the actual services. Switzerland spends 22% of its funds on Welfare and Social Services (Figure 6: Aggregate Swiss Government Spending).

The spending of the Swiss government differs greatly from the spending of other governments in the European Union (Figure 7: Comparison of Government Spending). This has the potential to present its own set of unique scenarios and challenges. In 2004, the average government expenditures of all OECD countries was 41% of GDP while the Swiss federal government spent 11.9% of its GDP on the administrative aspects of the federal government (Kraan and Ruffner, 2005, p. 39). Conversely, the expenditures of the local governments are typically more in line with the federal spending of other European nations. In 2004, the Swiss canton and local governments spent 39.1% of GDP, much closer to the average of federal spending for other OECD countries. Much of Switzerland's spending is done at the canton and local level, rather than at the federal level as is common for most other OECD nations. Out of 130 countries examined, Switzerland ranks 25th in terms of federal government spending compared to GDP. A brief chart below compares Switzerland to the US and countries in the EU of comparable living standards and human development ("Expense", 2012).

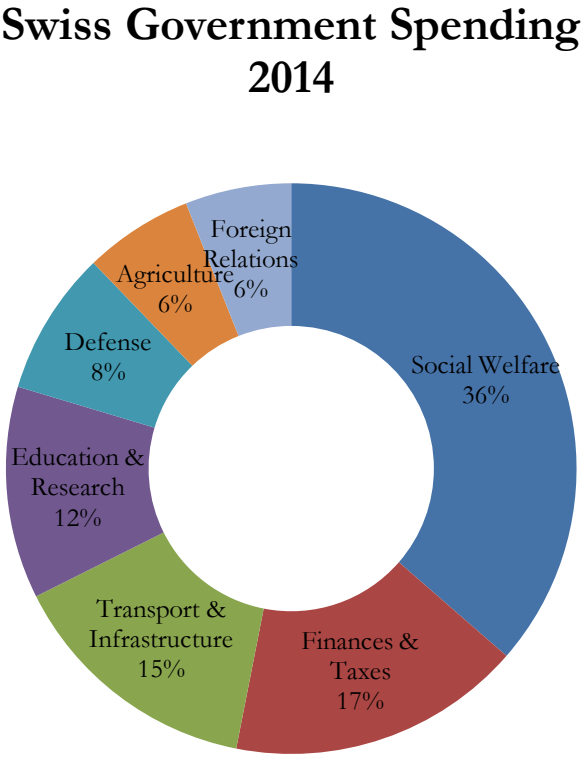

Figure 6: Aggregate Swiss Government Spending

Country Name	Rank (out of 130)	Federal Spending/GDP (%)	Percentile
Switzerland	109	37.8	83
USA	58	24	44.6
Germany	73	28.3	56.1
France	128	46.9	98.5
United Kingdom	119	42.1	91.5

Figure 7: Comparison of Government Spending

Tax revenue as a percentage of GDP in Switzerland was 29.6% in 2003, which is among the lowest of all OECD countries. The Swiss federal government obtains a large percentage of its income from payments and fees not classified as tax revenue because they are received as compensation for the performance of a concrete service (such as environmental and health insurance premiums), even if they cannot be easily avoided. If all obligatory payments are included, the Swiss total tax revenue totals 35.6%, which is close to the OECD average.

The Swiss budgeting system has three characteristics that differentiate it from most other OECD countries:

1. The nature of the direct-democracy as a way of achieving consensus among the citizens
2. The debt containment rule, which mandates a balanced budget over a fiscal cycle
3. The nature of the Swiss federal budget as mostly a transfer budget

The Swiss political system guarantees the autonomy of the individual cantons. The federalist nature of Switzerland allows each canton to create its own fiscal policy. This is facilitated through the use of the Swiss federal budget as a transfer budget. Most of the funds in the transfer budget are used for paying entitlements based on existing laws and contracts, diminishing the flexibility of the budget in the short term (Kraan and Ruffner, 2005, p. 48). This may change the type of government organizations interested in having WPI students' help, depending on how much leeway there is in the budget of the organizations. Though WPI does not charge the sponsors of an IQP, the sponsoring organizations still incur the costs of providing a workspace for the students and the salaries of the employee(s) in the organization that the students are working with.

2.7.5 Local Government

The revenue streams for the individual cantons are distinct from the revenue streams at the federal level. The cantons receive a share of the withheld income taxes, taxes levied on mineral oil and a share in the profits of the Swiss National Bank. In addition to their distinct revenue streams, the cantons and municipalities receive approximately 68% of the federal budget in transfers from the federal government. Of the 68% that is transferred, approximately 40% and 25% is transferred to the cantons and municipalities, respectively. More than half of the expenditures of the cantons are in the two important domains of health and education, while the municipal governments are responsible for promoting "environment and planning" and "culture and leisure" (Ladner, 2007, p. 10). The individual cantons have control over their education systems and social services, leading to a difference in the aforementioned services amongst the different cantons. Potential sponsors for future IQPs could be these canton and municipal governments to further the study of the differences in the quality of services provided by the different cantons and municipalities.

Municipalities are also responsible for administration of hospitals, care for the elderly, local roads and utilities. There are also differences in the levels and quality of services between the municipalities and cantons, which have the potential to warrant further study. The municipalities

have their own fiscal policy and are able to conduct their own business largely without interference of the canton. They can levy their own taxes, fees and charges.

Since the 1990s there have been serious efforts to reform the municipal governments. The Swiss financial system has been criticized as opaque, ineffective and inefficient. There have been efforts to more fairly distribute funds to the cantons and municipal governments and to reduce government waste (Ladner, 2007, p. 14). The different nuances of the Swiss political system present a unique cultural context that we will have to work with when looking for potential canton and municipal agencies to potentially sponsor future projects.

CHAPTER 3: Methodology

The fundamental goal of our project was to diversify the types of sponsoring organizations in the Switzerland Project Center to include sponsors outside of academia in non-government organizations, nonprofit organizations, local government, and industry. A more diverse offering of projects creates more choices and opportunities for students coming to Switzerland. We also created resources for starting and growing other project centers in the future. The Interactive Qualifying Project (IQP) is challenging to explain, so resources to help others understand the projects may lead to more opportunities in the future. Our project was completed between March 16, 2015 and May 5, 2015, however our strategies will be implemented following the close of our project term. Our methodology for accomplishing this is outlined in four steps, illustrated below (Figure 8: Methodology Outline).

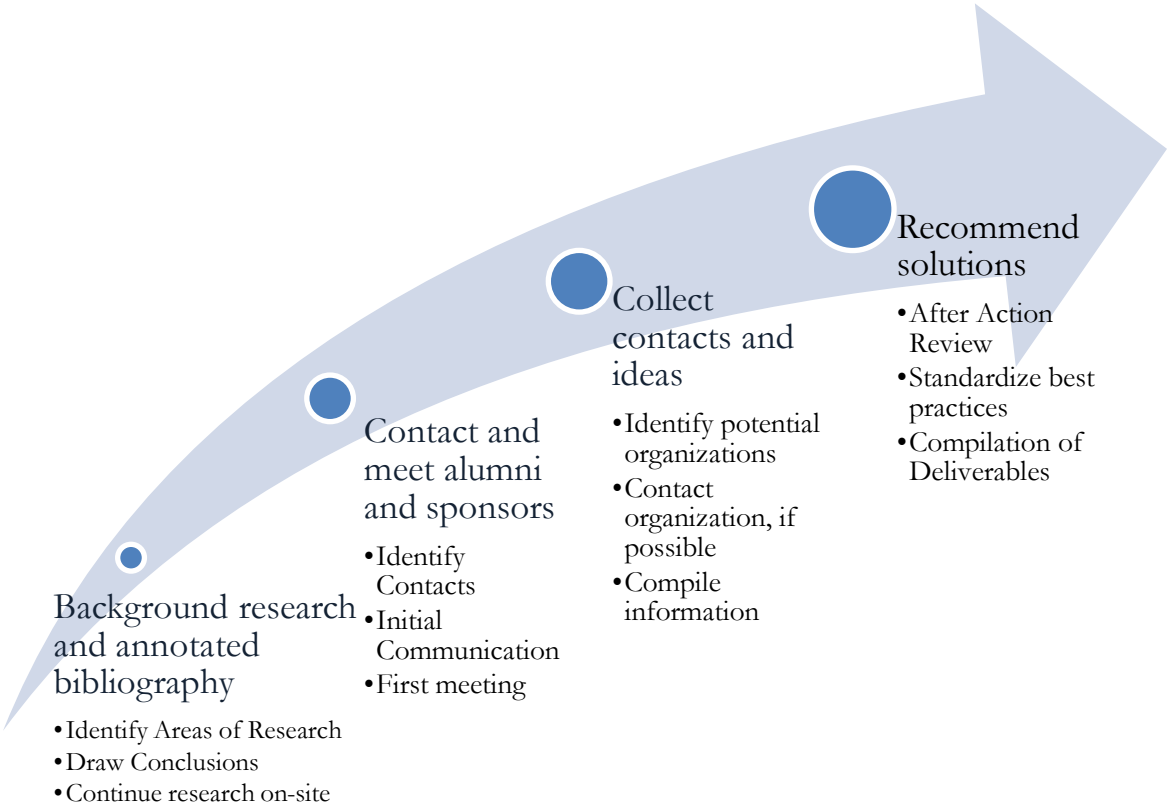

Figure 8: Methodology Outline

We completed background research in order to focus our strategy appropriately. We researched the different types of organizations in Switzerland and the strategies that have been used in the past to find new sponsors across Global Projects Program (GPP) locations. Then we created a plan for contacting alumni and past and present sponsors. We then collected ideas and advice for potential sponsors from our meetings. After each meeting we recorded detailed notes, and organized the best strategies into a standardized method that the Switzerland Project Center Director, Dr. Mann, and the Interdisciplinary and Global Studies Division (IGSD) office can use to find new sponsors in the future.

The timeline for our project is shown below (Figure 9:)

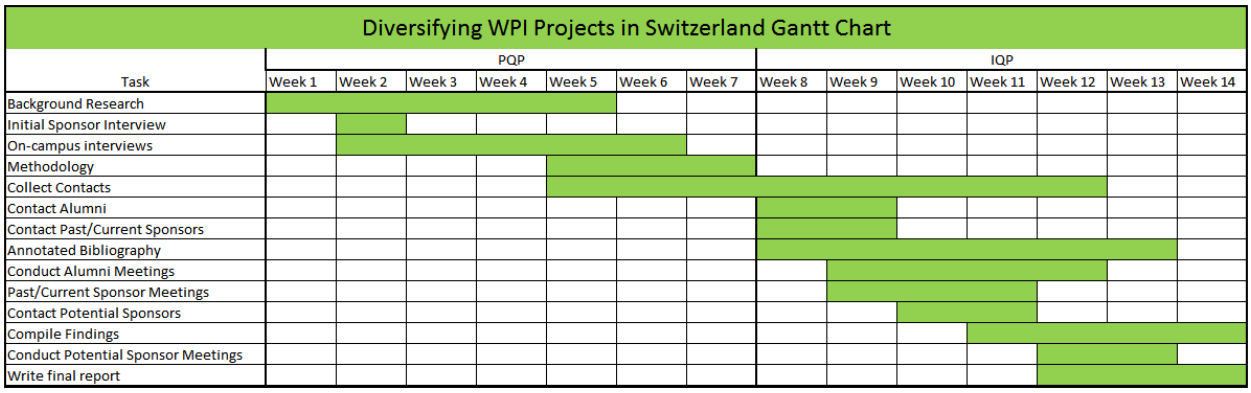

Figure 9: Project Schedule

While at WPI, we conducted several interviews with WPI faculty and members of the IGSD staff. Based on advice from center directors, who suggested using alumni to find new sponsors is helpful, we contacted all WPI alumni living in Switzerland. We compiled our findings into a deliverable report and presentation, as well as a detailed contact database.

3.1 Background Research

The first stage of our project was to research the types of organizations that may serve as good sponsors for IQPs. We also identified areas of research that were challenging to find information about, that we later investigated in Switzerland. We conducted research on the GPP and IQP in order to compile an annotated bibliography of the important articles that have been writen about the projects at WPI.

3.1.1 Identify Areas of Research

The main areas that we identified for research were: alternative types of learning, the Global Projects Program, Interactive Qualifying Projects, nonprofit organizations in Switzerland, and the structure of the Swiss government. To understand different types of out of the classroom learning and their role in students' education, we decided to focus on the three main types:

1. Project-Based Service Learning due to its inclusion of the community
2. Civic Engagement due to its encouragement of the general public to get involved with issues that affect them
3. Experiential Learning due to its nature of engaging students outside of the classroom in conducting a "real-life" project

We chose these areas because each of them shares a tenet with the IQP. To be able to adequately explain the aspects of the IQP to potential sponsors, we needed to have a thorough grasp of the other types of programs and their similarities and differences to the IQP.

The IQP is a complex topic that potential sponsoring organizations needed to clearly understand. We identified that it would be crucial to know about the following topics for the given reason:

1. The history of the IQP, in order to explain its history and relevance to potential sponsors
2. How the IQP is different from the other types of alternative forms of learning
3. How the IQP impacts the community and sponsoring organization
4. The role of the sponsor, so that they will be able to understand what commitments WPI expects from them and what they can expect from WPI and the students whom they are sponsoring
5. Trends in European project sponsors, in order to see if there is an underlying change in the theme of completed projects
6. The Switzerland Project Center, in order to determine its history and status
7. Previous strategies used to attract sponsors, in order to see what has and hasn't worked and to emulate the successes and avoid the failures of other project centers.

In order to determine the role that the IQP might play in Switzerland, we needed background information about Switzerland. Because nonprofits and nongovernment organizations

(NGO) tend to be good organizations for sponsoring projects, we decided that it would be important to have an understanding of their role in Switzerland, what they do, and how they function in conjunction with the Swiss government. Therefore, we decided to focus on these sections in order to understand how Swiss culture influences the role of nonprofits on social issues:

1. History of the Swiss government's involvement in social issues
2. Prevalence of nonprofits in Switzerland
3. Relationship between the Swiss government and nonprofit organizations
4. The Swiss population's attitude toward volunteerism and charity
5. The support of nonprofits by region

In addition to reading literature about our selected research topics, we conducted numerous on-campus interviews to gain other insights into our project. We conducted interviews with:

1. Dean Richard Vaz, IGSD
2. Professor Scott Jiusto, Director of the Cape Town Project Centre
3. Professor Stephen Taylor, Director of the Copenhagen Project Center
4. Mr. Bertram Dunskus, Project Sponsor, Aristo Consulting GmbH
5. Dr. Tara Mann, Project Sponsor, Switzerland Project Center

The interviews provided valuable information about how WPI project centers operate and what strategies have been used in the past to find new sponsors. Through the interviews we learned about the early years of the program and how it has continued to grow.

3.1.2 Annotated Bibliography

Throughout our background research we studied many journal articles, conference papers, websites, and books about WPI's curriculum and the projects that WPI students complete. It was decided that compiling the literature that has been written about WPI, the GPP, and the projects would be helpful to those in the future looking for further information about the projects. We read about fifty sources and organized them into an Excel spreadsheet. The spreadsheet has the citation information as well as key words and an abstract if one was available from the author. If an author abstract was not available, we wrote our own abstract, and indicated that it was not the author's work. The keywords in the spreadsheet can be searched to find applicable sources. We then wrote a summary of the sources synthesizing the main themes and highlighting the areas where there seemed to be a lack of information.

3.2 Contact and Meet Alumni and Sponsors

We decided that meeting with WPI alumni and past Switzerland Project Center IQP sponsors would give us a good idea of where the IQP fits into Swiss culture and society. In addition, these sources provided us with ideas and contacts in potential sponsoring organizations.

3.2.1 Identify Contacts

We identified our contacts based on our analysis of stakeholders for our project. We determined that the stakeholders who would be able to give us the most information would be past and current project sponsors and WPI alumni in Switzerland (Figure 10: Project Stakeholders).

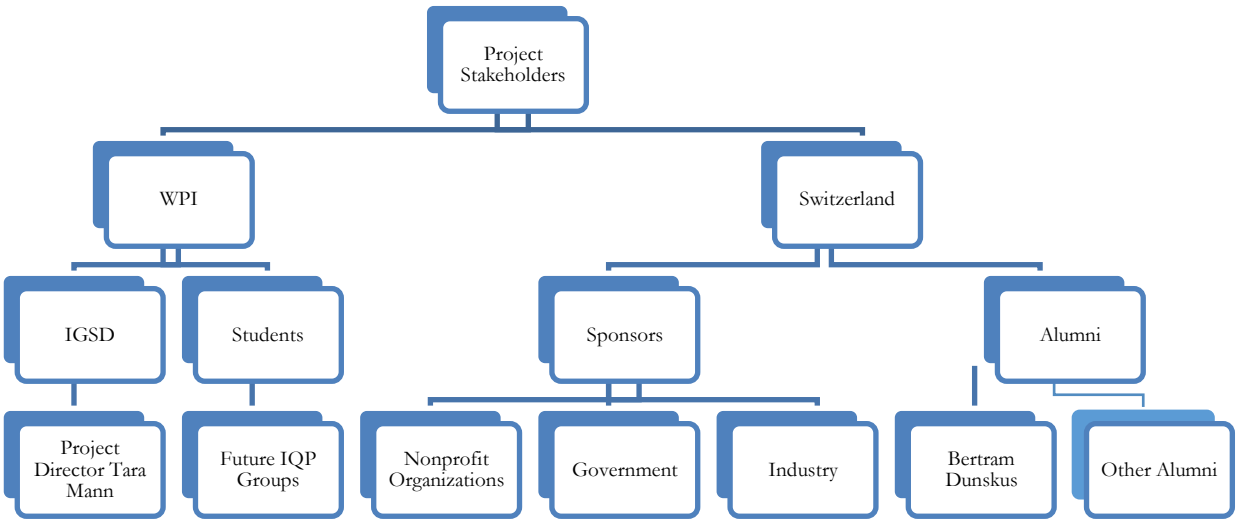

Figure 10: Project Stakeholders

First, we contacted past and future project sponsors. We did not contact present sponsors because they were busy with current projects. We contacted these sponsors first because they serve as a connection between Switzerland and the IQP. They have the knowledge of how the IQP is implemented and could give us ideas about how to explain the IQP to Swiss people. We also learned about their experience sponsoring IQPs and how the sponsoring process can be improved.

Next, we contacted WPI alumni who live in Switzerland. We requested contact information through Karen Bean, Director of Academic Advancement Special Projects, and she also provided us with suggestions about the most effective ways to contact alumni. Based on her suggestion, we wrote WPI alumni handwritten letters on WPI letterhead. We then corresponded with the alumni

through e-mail to set up meetings. We asked the alumni what types of organizations they thought would be good sponsors for projects, and asked for advice about how to best explain it to others. We also talked to alumni about cultural differences between the United States and Switzerland that would help us better understand Switzerland. We did not ask for specific contacts, but many offered them. We asked the alumni and project sponsors to conduct the initial contact to their recommended organizations to serve as an introduction. Unfortunately, during the final weeks of our project, we ran out of time to meet with all of the contacts we received, but we forwarded all the contact information to Dr. Tara Mann so she can contact everyone else.

3.2.2 Initial Contact

We used different methods of contacting different groups of key informants. The groups and types of contact are shown in the table below (Figure 11: Initial Contact).

GROUP	TYPE OF CONTACT	OBJECTIVE
WPI alumni	Handwritten letter on WPI notecard	Informational meeting, Learn about Swiss Culture, Advice
Past sponsors	E-mail	Interview about experience
Present sponsors	E-mail	Interview about experience
Future sponsors (A-term)	E-mail	Informational meeting/learn about experience
Potential future sponsors	E-mail	Meeting to Gauge interest
Contacts from other sources	Phone call/E-mail	Informational meeting/Swiss culture advice

Figure 11: Initial Contact

A draft letter to WPI alumni is shown below (Figure 12: Alumni Letter). We sent these letters to 27 WPI alumni in Switzerland to schedule meetings. We heard back from many of them and were able to meet with twelve of them.

Grüezi _____,

We are a group of three WPI students working on our Interactive Qualifying Project (IQP) in Switzerland. Our project is to study Swiss culture to determine which types of organizations would be interested in working with future IQP groups coming to Switzerland.

If you are willing, we would like to meet with you while we are in Switzerland to learn about Switzerland and how you think the IQP fits into Swiss culture. We just arrived in Zürich and will be here through the end of April. We would be happy to travel to you or to meet via conference call if that is your preference. We can be reached via e-mail at z15IQPs@wpi.edu

Thank you very much for your time and we look forward to hearing from you,

Sincerely,

Zachary Richards, Carolyn Keyes, Mariella Creaghan

Figure 12: Alumni Letter

After we received contact information from organizations that may be interested in sponsoring an IQP, we sent them the below e-mail. We also included, as attachments to the e-mail, a flyer that we created and a list of example projects with their abstracts. These are detailed in the list of items given to potential sponsors below (Figure 13: Potential Sponsor Letter).

Good Morning _____,

We received your name from _____. We are a group of three students from Worcester Polytechnic Institute, a technical university in Massachusetts, USA (www.wpi.edu), and we are currently working on a student project here in Switzerland. Our project focuses on expanding the scope of projects offered in Switzerland by our university by finding new and different organizations to work with us on these projects in the future. We have attached a flyer which explains the project opportunity and another document which contains sampling of projects that have been done with different organizations in the past.

Our team will be in Switzerland for the next two weeks and would be happy to discuss this opportunity with you. Please let us know if you have any questions and if you are interested in meeting to learn more. Thank you for your time and we look forward to possibly working with you in the future.

Sincerely,

Mariella Creaghan, Carolyn Keyes and Zachary Richards
Z15IQPs@wpi.edu

Figure 13: Potential Sponsor Letter

3.2.3 First Meeting

The initial meeting with contacts varied depending on the goal of the meeting. The following questions were a summary of what we asked in the meetings (Figure 14: Interview Questions).

WPI Alumni	-How well do you know the IQP? -Where do you think the IQP would best fit in Switzerland? -How do universities and organizations interact in Switzerland? - Is "Sponsor" a good term for the Swiss partner in the IQP? -Do you think Swiss organizations would be willing to pay a small fee for an IQP? -Who do you think would be a great sponsor for an IQP here?
Past/Current Sponsors	-Why did you become a sponsor? -How was the IQP described to you? Did it make sense? -What do you wish you knew about IQP before becoming a sponsor? -Would you recommend to others becoming a sponsor? -What was the most beneficial thing you got out of being a sponsor?
Potential Sponsors	-Explain what the IQP is and who we are. -Describe the responsibilities and benefits of sponsoring an IQP. -Does sponsoring an IQP sound interesting? Is it something you would like to learn more about? -What are your hesitations or concerns? -How can we make you feel more comfortable about this process? -What types of projects do you have that WPI groups could help you with?
Other Contacts	-Explain what the IQP is and who we are. -Do you have any ideas of companies/individual who may be interested in learning about the IQP? -Do you think the goals of the IQP are achievable in Swiss society?

Figure 14: Interview Questions

Although we never actually used it in a meeting, we developed a simple PowerPoint presentation that could be used in the future to give a brief overview of the IQP to a potential sponsor. The slides are below (Figure 15: Slides from Sponsor Presentation).

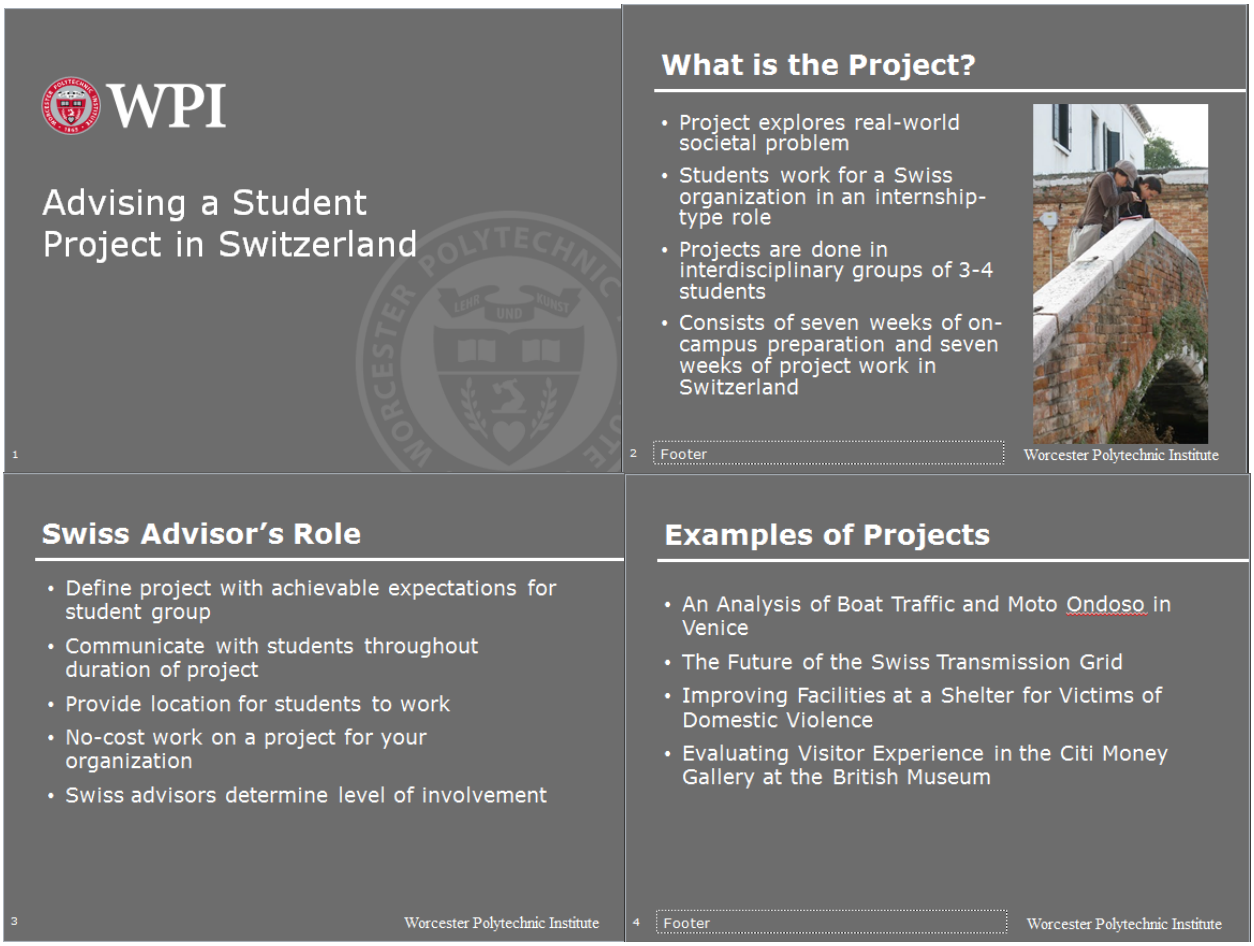

Figure 15: Slides from Sponsor Presentation

When we met with potential sponsors, we provided them with variety of information about WPI and the IQP. Some of these resources were brought from WPI, and some were developed by the group. Further information about tools developed by the group can be found in section 3.4.3. A picture of the folder given to potential sponsors is below (Figure 16: WPI Informational Folder):

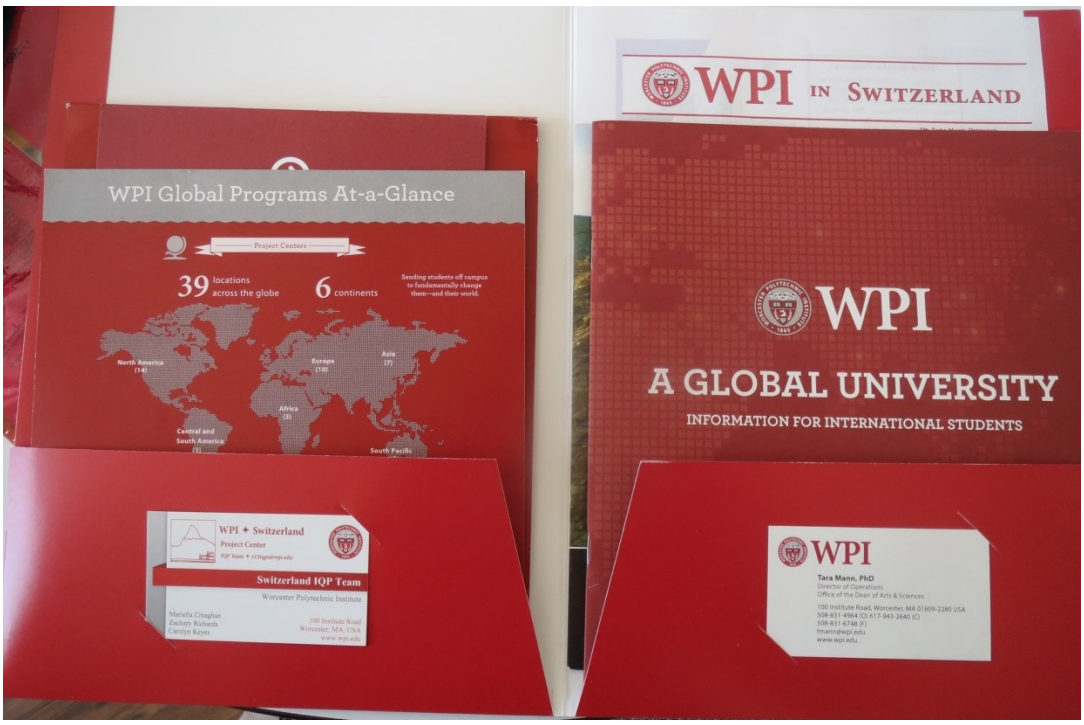

Figure 16: WPI Informational Folder

3.3 Collect Contacts and Ideas

In order to find our initial contact base to begin our approach of finding future sponsoring organizations we used the information we gained out of meeting with WPI alumni for their recommendations of organizations to contact and any specific people they may know in these organizations. Even if the alumni didn't know any specific individuals in the organizations, they still provided us with ideas of organizations we can contact.

3.3.1 Identify Potential Organizations

Through our meetings with alumni and past sponsors we have identified potential organizations and maintained a list thereof that we believe may be a good fit for sponsoring future IQPs in Switzerland. Our identification of potential organizations was primarily through organizations recommended to us during alumni meetings.

3.3.2 Contact Organization, if Possible

Through our meetings with alumni, we found that having a personal introduction through a mutual contact would yield more responses than cold calling. We have taken advantage of the

diversity of professions and backgrounds of WPI's alumni in Switzerland. We used the contacts of the alumni to set up meetings with organizations that they recommended.

3.3.3 Compile Information

Meeting minutes were taken and electronically added to our records for each meeting with WPI alumni, sponsors, and organizations. In order to quantify this information, we created an electronic form that we used to gauge the results of our meetings and as a way to track the type of meeting (alumni, organization, etc.) and our ability to explain the IQP. This form may be found in Appendix B: Interview Form. The form contains basic information such as name, date and type of organization that we met with.

To keep track of all contacts and communication with these individuals we constructed a spreadsheet of contact information that tracks our communication with potential sponsors. The spreadsheet contains the following information:

- Name
- E-mail
- Contact type (alumni, past sponsor, future sponsor, etc.)
- Location
- Phone number
- Profession/company

3.4 Recommend Solutions

At the conclusion of our project, we developed a strategy for finding new sponsors that is outlined in our results section. We recommended some specific organizations that we have contacts for, as well as some organizations and sectors that, based on our research, could sponsor meaningful IQPs, and that we do not have a specific contact for. We have compiled what we found to be best practices for finding new sponsors and explaining the IQP into findings and recommendations. The below steps outline our process in determining our strategy.

1. Review and Develop Best Practices: Determine what works and what does not work when explaining the IQP and our objectives to individuals and organizations in Switzerland

2. Compilation of Deliverables: Submit our deliverables to IGSD so that they may be used in the future for setting up future projects.

3.4.1 Review and Develop Best Practices

After our meetings, we reviewed what worked and needed improvement when explaining the IQP as well as how we can improve our meeting strategy. In our alumni interviews, we were able to notice some trends after reviewing our meeting notes. These are compiled in our results sections. When our interviewee did not know much about the IQP, we noted what was instrumental in explaining it so that we could use that method the next time. The following questions are what we mentally kept track of during the process so we could develop a strategy for networking with potential sponsors in the future.

- What is the best way to explain an IQP?
- Who do alumni think would be most interested in working with us?
- What form of communication works best to contact potential sponsors?
- How long did this process take? (i.e. time lapse between initial contact and interview?)
- What brochure/pamphlet led to better understanding?
- What do sponsors want to know about an IQP?

After reviewing and compiling our findings in our findings section, we developed recommendations to address the findings that will help improve the Switzerland Project Center for the future. We also outlined our recommended strategy for Center Director Tara Mann to use when finding sponsors for the future. Many of our recommendations are ongoing and could be applied to other project centers as well.

3.4.3 Tools Developed

Along with our recommended strategy and findings, we developed tools that can not only be used for the Switzerland Project Center but for any project center with minimal changes. We created the following resources over the course of our project:

1. Annotated Bibliography: A Spreadsheet containing citations of relevant literature about the IQP, Global Projects Program (GPP) and their history (Found in Appendix D).
2. Literature Review: A summary of the main themes found in the annotated bibliography sources (Found in Appendix E).

3. Sponsor Guide: An information booklet explaining what to expect when sponsoring an IQP and past project examples and abstracts (Found in Appendix C).
4. Informational Flyer: A summary of WPI and the IQP with color photos and concise project examples (Found in Appendix A).
5. Team Biography Template: An information sheet that can be sent to sponsors giving them more information about their team. Includes a photo and background information (Found in Appendix F).
6. Example IQP Packet: A packet that provides example project abstracts from a variety of projects in Europe (Found in Appendix C).
7. PowerPoint Presentation: Short PowerPoint which describes the IQP (Found on page 47).

CHAPTER 4: Results, Findings & Recommendations

This chapter explores the major findings of the project. It was discovered that complexities exist surrounding the description and definition of the Interactive Qualifying Project (IQP), and explaining it to those unfamiliar is not an easy feat. Explaining the IQP in the setting of Switzerland exposed us to cultural differences, further explored in section 4.2. These cultural differences further complicated our efforts to explain the IQP to interested organizations. Cultural differences also require that aspects of the program be customized to fit Swiss culture. One cultural difference found through meeting with past and upcoming project sponsors was the desire for reliable communication and access to information. Continued communication with both sponsors and alumni also provides an opportunity for networking. This networking proved to be valuable throughout the project, as alumni and past sponsors provided suggestions for types of organizations might be interested in working with WPI, and in some cases specific contacts within those organizations.

4.1 Explaining the IQP

4.1.1 IQPs can vary extensively, which causes it to be complicated to explain.

After telling many people what the IQP was in different ways, both in written and spoken communication, we found that the IQP is difficult to explain concisely and in a straightforward way. The IQP is complicated because it can take on many forms depending on where the project is done. It is not an internship, apprenticeship, or a technical project, as many of the people we talked to first thought. In Switzerland, students typically have these types of programs, but none are social oriented, like the IQP. Because the IQP is not one specific type of project, but can incorporate many disciplines, it makes it hard to understand.

We found that the most productive way to tell someone about the IQP was to have a discussion. After talking about the goals of the IQP and the connection between the students, faculty advisors, and community, and answering any questions, the people we talked to were able to have a good idea of the IQP. However, it was hard for many of them to envision what a project topic would be without concrete examples of some projects that have been done in the past. We have found that relevant past projects are the most important tool in explaining the IQP to anyone. One of our contacts did not understand the IQP in the beginning, but after giving him some example projects done in his field of transportation, he was easily able to see what different organizations could be interested in sponsoring an IQP.

It is important that the topics of these example projects are relevant to the potential sponsor. A recent sponsor mentioned that the exciting and ambitious projects that are highlighted in WPI promotional materials can be discouraging to potential sponsors, who then think that their projects would not be good enough to propose.

After realizing that the example projects were so important in explaining the IQP, we created a document that has five different example projects that we thought would be relevant to potential sponsors in Switzerland. They include a variety of projects in different sectors from other European project centers, including Venice, London, Copenhagen and Switzerland. The document includes the names of the projects, the project center and sponsor and the abstract from the student report which gives a brief explanation of what the problem was and what the students did to solve it. It also gives a link to the full report on the WPI website.

Recommendation: Give potential sponsors example projects before meeting

In addition to the document of example projects we created, one or more especially relevant project descriptions should be added. These projects should highlight the contact's area of interest. Emphasis should be placed in the interdisciplinary nature of the IQP because interdisciplinary projects are not as common in Switzerland as they are in the United States.

4.1.2 It is challenging for people to understand the IQP is not a technical, engineering project

Many people have a hard time understanding that the IQP is not a technical project. Engineering students in Switzerland typically work with different companies and organizations on engineering projects. Consequently, as soon as we mentioned that we were engineering students most contacts thought that we are looking for sponsors for an engineering project; therefore they recommended that we look at engineering companies. We have learned that when a project is interdisciplinary, it needs to be mentioned specifically that the project is an interdisciplinary project.

Recommendation: Emphasize interdisciplinary aspect of the IQP by distinguishing it from the MQP.

An effective way to demonstrate that the IQP is not a technical engineering project is to give examples and show the differences between the IQP and Major Qualifying Project (MQP). The example we liked to use is of the project, "Broadening the Impact of a Low Cost Fruit Dryer for Developing Countries" that is also currently being completed in Switzerland. We explained how an MQP or engineering project would be designing the fruit dryer or making it more energy efficient or

some engineering aspect of the fruit dryer, while the IQP evaluates the usage of the fruit dryer and improves how it can be used in different societies and cultures. This reliably helped our contacts understand the IQP.

4.2 Cultural Findings

4.2.1 It is difficult to identify the best location for the Switzerland Project Center.

Over the course of our project we have received many different opinions about where it would make sense to have the Switzerland Project Center. Language was one of our major concerns, as WPI projects are not conducted in any of the four national languages of Switzerland (German, French, Italian, Romansh), but in English. Another of our concerns was making sure that students are able to experience the culture of Switzerland, since part of the purpose of the IQP, when completed through the GPP, is the cultural experience.

Due to the language concern, many of the people we talked to suggested that it would be easiest to find organizations willing to conduct projects in English in large, international cities such as Zurich or Geneva. These cities would be likely to have the highest concentration of English speakers. International cities are likely to have more international organizations that conduct business in English. This could improve the IQP experience because the students would be able to be incorporated into the organization and be able to understand everything that is happening. However, the Switzerland Project Center has already conducted many projects in smaller cities and in organizations where the primary language is German, so it is still possible to complete successful projects in other locations. Still, in these large cities, there are also more organizations in closer proximity, so it would be easier to find sponsoring organizations nearby.

The second concern was for students to be able to have a rich culturally Swiss experience in whatever city the project center is based. Some of the alumni we met with said that Zurich would provide students with a more culturally Swiss experience, while Geneva draws a larger international population which affects the culture of the city.

Figure 17: Zurich, Switzerland

"Zürich" by MadGeographer - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:Z%C3%BCrich.jpg#/media/File:Z%C3%BCrich.jpg

Recommendation: Zurich would be an international and culturally Swiss city for students

We have found that Zurich would have the benefits of being a large international city with many different organizations that could sponsor IQPs, while still retaining a culturally Swiss atmosphere. This would provide students with sponsors in close proximity as well as an immersion into Swiss culture, where a high concentration of people would be able to speak English.

4.2.2 The term "sponsor" should be used carefully in Switzerland

Throughout our communication with citizens of Switzerland and German-speaking Europe we have learned that the term "sponsor" has a different connotation than it does in the United States. In Switzerland, the use of the word "sponsor" overwhelmingly implies a financial contribution and often solely a financial contribution. This differs from WPI's definition of the term, which implies a contribution of time and a workspace for students, and occasionally a small financial contribution. Currently, project fees are not requested in Switzerland; however we have found that they could be feasible and have recommended a fee structure in section 4.2.4 below. It been suggested to us that we use instead the terms: *advisor, partner, Swiss advisor, liaison,* or *host.*

Recommendation: Explain what 'sponsor' means in verbal communication; in written communication, use 'partner'

It is however still possible to use the word *sponsor*. During verbal communication with sponsors we suggest that the intricacies of WPI's definition of the word be explained to eliminate any confusion resulting from the differences of the definition that is prevalent in the culture of Switzerland. It can be explained that WPI is not asking project sponsors to provide housing or other financial support for the students. By explaining that the sponsors would not pay the students directly, their concern of having to provide work permits for the students will be alleviated. Work permits are difficult for United States citizens to obtain, especially for 7 weeks ("Work Permits", 2013).

We recommend that the term *sponsor* should not be used on exclusively written information (e.g. posters, flyers, brochures, etc.) because it will be hard to immediately explain WPI's definition and may leave potential sponsors with the wrong impression of the IQP and its terms. We recommend that on written materials the term *partner* be used instead because it accurately conveys the mutual benefit. When conducting phone conversations or in-person meetings, using the term *sponsor* will not be problem. After the use of the word, explain the differences between WPI's and Switzerland's definitions. It is best that these differences be explained immediately so as to not let the impression be created that the organizations must be able to pay to collaborate with WPI.

4.2.3 Prompt communication is expected by the people of Switzerland

Throughout our work, we learned about intricacies surrounding communicating with the people of Switzerland. We noticed that the Swiss are generally extremely quick to respond to e-mails and return phone calls, and therefore they expect the same from the people they communicate with. The project sponsors also appreciate knowing the status of their projects, especially during the planning stage after the project description is initially submitted. They would like to have regular updates about their project and its timeline, from when the description is initially submitted to WPI, to when the students actually arrive and begin working on the project in Switzerland.

Recommendation: Respond promptly to any form of communication

We recommend that high importance be placed on ensuring that communication with sponsors and other contacts is prompt. If a full response is not possible, for example, if one is waiting on information from a third party, to let the contact know they have not been forgotten, and you will give them a full response as soon as possible. If a proposed project is not chosen, it is

important to remain in communication with the sponsor so the possibility can remain open in future years.

4.2.4 Project fees are likely to be feasible for some types of organizations

Project Fees are small fees that some sponsoring organizations pay to help offset some of the costs that WPI incurs during the projects. Although project fees are fairly common in MQPs, they are less common in IQPs because many of the IQPs are done for organizations that are financially strapped or in developing countries. However, in prosperous countries, many sponsors are willing to provide a sponsor fee for the project to show that they value the work accomplished. One example of a project center that has a sound method for establishing project fees is Melbourne, Australia. Professor Holly Ault, the director of the project center, explained to us the process for project fees in Australia. She said that typically, after assessing the ability of the sponsor to pay, they ask the sponsors to as a minimum, pay for the transportation passes for the students that cost between AU$150-AU$250. If they are first time sponsors, they are only required to pay if they were satisfied with the result of the project. For sponsors with more funds, they negotiate a project fee up to a cap of AU$6000. There are, of course, other factors that affect an organization's ability to pay sponsor fees, such as the political climate (government funding) and the availability of grant money. There are also exceptions to the rule, such as when a loyal sponsor agrees to take on an extra project at the last minute. The system, however, works well and every sponsor knows the agreement before the project begins.

We have been investigating the possible use of project fees at the Switzerland Project Center. By talking to many Swiss alumni as well as past IQP sponsors, we got the overall response that most organizations would be willing to pay a project fee for the IQP. One contact said that unpaid work is not common in Switzerland, so most companies and organizations would have no problem supplying a project fee. These project fees would hopefully cover the transportation costs for students, and reduce the high cost to students completing their IQP in Switzerland. This will make the project center more accessible to students, while showing that the sponsors value their work. As long as a structured format for charging sponsor fees is organized, similar to the Australia system, project fees should be feasible in the Switzerland Project Center.

Recommendation: Determine project fee structure for Switzerland Project Center

Accordingly, we recommend that a project fee structure be determined to fit the needs of the Switzerland Project Center. Since the train passes are much more expensive than in Australia, it

is probably not feasible for the minimum fee to cover the train pass for the whole seven week period. A possible fee structure could start with the minimum fee being CHF 500 per student. This would be a manageable amount of CHF 2000 per project. For a new sponsor, this should be charged only after the project is completed and the sponsor is satisfied with the work. It should be discussed beforehand and agreed upon, but only charged afterward. The Swiss, due to cultural differences, like having detailed information about any agreement so a signed contract might be a possibility for agreeing on fees. For sponsors who can and are willing to pay more, fees should be charged in CHF 500 increments per student capping at CHF 6000 which would fully cover train passes for four students (4 x 15-day Swiss Pass @ CHF 374 per student). However, the money should be collected by WPI to reduce the costs for all students so that everyone ideally would have at least half of their transportation costs covered. This is very important for the future of the project center because if students continue to have to pay CHF 1500 just for mandatory transportation fees, they will rather go to less expensive project centers or do their project on campus to save money. Housing fees in Switzerland are also expensive; currently the Switzerland Project Center charges $3100 per student for housing. However, we have chosen to evaluate only transportation costs for the sponsor fees because it is a good starting point. As project fees are implemented and if transportation is fully covered, the money should go towards lowering the students' housing fees. Below is an example fee structure with three tiers of organizations, Tier 1 being able to pay the most and Tier 3 paying the minimum. The organizations listed are purely an example; we have not talked to enough organizations about project fees to be able to determine what they would be willing to pay.

Possible Switzerland Project Center Fee Structure		
Sponsor Tier	Possible Type of Organization	Cost per Team (4 students)
Tier 3	First Time Sponsor, Schools, Universities	CHF 2000
Tier 2	NPOs, Small NGOs	CHF 4000
Tier 1	Large NGOs, Industrial, Banking	CHF 6000

4.2.5 Large organizations will usually be more able to complete projects in English

From talking to alumni, we have learned that large international organizations would have the most English-speaking populations. The best sponsors would have an English-speaking work environment, because even if the sponsor can speak English, it would be hard to incorporate the students into the work environment if the business is usually done in German or French and none of the students speak the language. However, large organizations that reach across international

borders normally conduct business in English, so it would be easier for an IQP team to work with them. Larger organizations also have more funds and more resources so it would be easier for them to find the ability to work on an IQP with a team.

Although large organizations have some advantages, they may not have a need for a WPI team because they may already have manpower and international perspectives. A smaller organization which is undermanned and wants to have an international perspective might have more to gain from sponsoring an IQP.

Recommendation: Look into larger organizations but remember smaller organizations

We recommend looking into larger organizations that have an international reputation as potential sponsors for IQPs because they are likely to speak more English and have resources and knowledge to work with us on IQPs. We also recommend looking for opportunities in smaller organizations that have resources to sponsor the IQP, because they may be more eager to sponsor a project.

4.2.6 Swiss universities and industry share a strong relationship

We have found that there is a very strong university-industry relationship in Switzerland, and that there is a door to most industrial companies and research organizations through the universities. Since two-thirds of Swiss students choose vocational school education that includes apprenticeships and many of the remaining one-third are required to have internship experience before enrolling in a University of Applied Science, it is natural that education and industry are so connected. The 'Higher Education Institutions' of Switzerland, including the two federal technical institutes as well as the cantonal universities, the universities of teacher education, and the universities of applied sciences, all perform a large amount of research in Switzerland. The public funding for the majority of basic research goes to the federal technical institutes and cantonal universities and university-supported specialized research institutes. The universities of applied sciences, however, focus on more hands-on programs that apply research to the needs of the Swiss economy ("Higher Education and Research in Switzerland", 2011). Seeing as how there is a great deal of research done by universities, we have heard them dubbed as 'the research arm of the companies' in Switzerland. Accordingly, it makes sense that some IQPs currently being implemented are with universities in collaboration with different companies and organizations, for example, in A-term 2015, HEG-Friborg is sponsoring a project with Swissgrid.

Recommendation: Leverage existing university contacts into industry relationships

We recommend that if WPI is interested in implementing IQPs or MQPs with industries or companies in Switzerland that they go through their existing university contacts to find someone from the university with connections to the particular industry. From there, the industry will be better able to understand the context of the student projects because they are used to working with universities.

4.3 Past and upcoming sponsor feedback

4.3.1 Feedback about project selection is important

Past sponsors indicated that it would be helpful for potential sponsors to have a sense of how the project selection process works, and when they should expect to hear back from WPI about whether or not their project was selected. Some past sponsors also would find it helpful to get feedback if their project was not selected to determine how to make a better project or project description the next time.

Recommendation: Update potential sponsors on project status

When a potential sponsor submits a project description, we recommend that they receive a confirmation e-mail that their description was received and some information about what the process entails. The e-mail should inform the potential sponsor of a rough time period when they can expect to hear if their project was selected.

When the projects are selected, everyone that submitted a project description should be notified whether or not their project was chosen. If their project was not chosen the e-mail should include a brief explanation of why it was not chosen, even if the only reason is that there were too many projects to choose from.

4.3.2 A sponsor information guide would be helpful

Through meeting with sponsors from 2013 and 2014, as well as sponsors for A-term 2015, it was found that they would have liked to have more information about the IQP before the projects started, and throughout the preparation term. Some sponsors were unaware of the timeline of the project, and they were not sure when to expect to hear from their group.

Sponsors discussed the desire to have short student biographies in order to learn about the students' interests and backgrounds, as well as a timeline that shows when the students begin preparing and when they arrive in Switzerland. Some sponsors were surprised by how prepared the

students were when they arrived. A more detailed description of the IQP could help sponsors understand what the students are doing and how to be best prepared when they arrive. Giving sponsors examples of project summaries would help sponsors understand the type of work that is typically completed. One sponsor suggested a handbook or packet with all necessary information be given to sponsors when they agree to sponsor a project. This would ensure that all sponsors receive the same information, and that they are well prepared to host the students.

Recommendation: Distribute Guide for Project Sponsors to sponsors

Once the projects have been selected, we recommend that each of them receive a packet of information about the process of sponsoring an IQP. This guide includes the following items and can be found in Appendix C: Guide for Project Sponsors.

1. Overview of WPI
2. Description of GPP and the projects
3. Detailed description of IQP including the learning objectives – stress the concept of interdisciplinary
4. Examples of past projects
5. Roles and Responsibilities (WPI vs. students vs. advisors vs. sponsors)
6. Timeline of preparation term and on-site term
7. Student bios with picture and a short biography including major, interests, etc.

Although the inclusion of information about WPI and the GPP may seem excessive in comparison to the norm at other project centers, through interviews we have determined that an excess of information is much preferred to a lack of information. Providing sponsors with background about the university and the reasons for the project as well as the learning objectives will allow them to better understand the projects.

4.3.3 Availability of information about the IQP is needed

It was found through meeting with past and present sponsors that they would like a resource for learning more about the IQP. Sponsors sometimes wanted more information throughout the process but they were hesitant to contact WPI whenever they had a small question. Some sponsors asked if there was a website that has resources for sponsors. The creation of such a website would minimize the time taken for sponsors to find more information about the program and make

sponsors more comfortable about participating in the program if they were able to find out basic information about sponsoring a project without needing to contact WPI.

Recommendation: Consolidate information about the IQP onto single IGSD website page

The Guide for Project Sponsors that we created will serve as a location for sponsors to get most of the basic information about sponsoring a project but will likely not answer all of their questions, especially specific questions about their project and its status. For more detailed information we recommend that IGSD add a tab to their website that has more information about sponsoring a project. This website might also incorporate a way to contact WPI for organizations not sponsoring a project but have been referred to the website by a friend or colleague. Though no two project centers have the same details, the website should be able to answer information for most sponsors as there are commonalities across all of the project centers. Overall, this website will lead to more informed sponsors while simultaneously reducing the effort required by WPI to inform sponsors individually, especially if there is a common theme across the questions that the different sponsors have been asking.

4.4 Networking Strategies

4.4.1 Alumni are willing to help and are a great resource in making contacts

In our effort to learn about Switzerland and the types of organizations that might be interested in collaborating with WPI, letters were written to all WPI alumni living in Switzerland seeking advice for the project. Of the 26 alumni contacted via hand-written letters, more than 50% responded willing to help with the project. The alumni we met with, without exception, were helpful in teaching us about Swiss culture and suggested possible organizations or sectors which might be interested in sponsoring IQPs. Alumni were also interested in learning about what is new at WPI and about our experiences there so far. Many alumni remembered their own Interactive Qualifying Projects, and were happy to assist with our project.

The majority of the alumni met with received their education in some form of math, science, or engineering and therefore most work for companies in industry. The alumni are well connected and have personal contacts with many organizations, most commonly industry companies. Although they were able to recommend some NGOs and government organizations, they were mostly general recommendations without specific contacts. Some alumni were born and raised in Switzerland, while others were Americans who later moved to Switzerland. It was valuable to gain the insights of both groups, as native Swiss alumni often had more knowledge about Switzerland, but the American

alumni could provide information about the differences between Swiss and American society and about living in Switzerland as an American.

Recommendation: Update alumni and keep connected

It is recommended that WPI sends updates to alumni in Switzerland regarding the projects being completed. Many alumni were surprised to hear that 22 students working on six projects were currently in Switzerland, and they were excited to learn more about the projects. By keeping the alumni informed about WPI's activity in Switzerland, a relationship is maintained between the project center and the alumni. This allows for alumni to become more involved with WPI and to continue to be resources for finding new sponsors. The contacts that the alumni have are a valuable resource for the project center and we have found that most are happy to help out WPI students.

4.4.2 Inviting alumni and potential sponsors to final presentations allows for networking

Through our meetings with WPI alumni, we have found them to be receptive to WPI's activity in Switzerland. They enjoyed us updating them on WPI and what WPI is doing in Switzerland. The alumni also enjoyed learning about the types of IQPs students are doing in Switzerland. They were also interested in helping us with our projects. They gave us numerous ideas of organizations that might be interested and also any contacts that they had for such organizations. They also expressed interest in attending the final presentations to see other projects the students are doing and to meet with the WPI faculty, current project sponsors, students and other alumni. Because examples are a helpful way for interested people and organizations to understand the IQP, the IQP final presentations would be a good opportunity for WPI to raise awareness of its involvement in Switzerland.

Recommendation: Host project center reception in conjunction with final presentations

The final presentations should be hosted as a reception with a large enough venue to invite alumni, current sponsors, future sponsors and people interested in learning more about WPI and its involvement in Switzerland. The time of the presentation day could be extended to allow time after the presentations for networking between the attendees. If enough interest is expressed, the presentations could even serve as a "project fair" for students to showcase their work.

4.5 Growing a Project Center

4.5.1 Overall, there is relatively little information about growing or starting a project center

In our research, we have found that there is relatively little written about growing or starting a project center. Besides the few student IQP feasibility analyses that have been done, we have only found a small number of written bits and pieces of the history of different project centers. There is no centralized study or any centralized information about project center growth. The only project center for which we found a good history was the London Project Center, as the first off-campus project center. There are also very few standardized resources that professors who are starting new project centers can use for marketing and for reference when finding sponsors for their projects. Although the project centers are very different, the methods used to complete projects are very similar so some centralized resources would prove helpful.

Recommendation: Modify materials we developed for use in other project centers

We recommend that our Switzerland Project Center flyer be used in other project centers as well. Our Guide for Project Sponsors could also be used in different project centers with limited changes. It would also be useful for a WPI professor to possibly complete a study on how different project centers have developed throughout the history of the Global Projects Program because this would be an invaluable resource for starting and growing new project centers.

4.5.2 Introduction from a trusted source is helpful

Throughout our interactions with different alumni, past sponsors and contacts, we found that an introduction from a trusted source is very helpful in getting organizations interested in sponsoring an IQP. For example, we met with an alumnus and he knew someone he thought would be interested in sponsoring an IQP, or at least working with us, and he called them during the meeting and had us schedule an appointment. People, especially in Switzerland, like to have some connection to WPI before they even take the IQP into consideration. Alumni are able to refer us because they know about WPI and about the IQP program and trust that we do quality work. Past sponsors are also able to refer us because they have seen the work an IQP team did in the past and can share their experience with a new contact. Although cold calling or e-mailing has the potential to work, especially in Switzerland, it is not as effective as an introduction from a trusted source.

Recommendation: Contact new organizations through existing contacts, if possible

We recommend that WPI contact new organizations through existing contacts, especially WPI alumni and past IQP sponsors. Personal contacts are also very helpful, so any personal

contacts should be taken advantage of. First, explain what the IQP is and what the process for sponsoring an IQP is to your contact and the alumni, and make sure everyone is clear about the facts before they start suggesting people to contact. After this, suggest that they talk to their contacts first to explain some of what WPI is trying to do and tell them that they will be contacted shortly by a representative for more information. After, send them information and make sure they understand the IQP. Although it is important to contact new organizations through a trusted source, it is still important to have contacts in a variety of different sectors. It is important to break into new sectors even without existing contacts.

4.5.3 Many Swiss companies are involved with the community

Many Swiss companies participate in environmental and sustainability efforts. The two largest retailers in Switzerland, Migros and Coop are particularly involved in creating sustainability and community programs. These companies were recommended by alumni as companies that may be interested in working with WPI due to their active community involvement. Migros, for example, operates five parks throughout Switzerland in addition to water parks and sports facilities. Coop is well known for its sustainability efforts and push for organic food products. Other Swiss companies, such as the largest transportation company, SBB, are also undertaking sustainability projects to minimize the energy they use and their impact on the environment.

Recommendation: Find and contact companies involved in the community

It is recommended that Migros and Coop be contacted to determine if they are interested in working with WPI. Because of the social nature of the IQP, and the common theme of sustainability within the IQP, it is possible that some of Migros' and Coop's environmental and sustainability initiatives will align with those of the IQP.

4.5.4 MQPs would be a good fit in Switzerland

Due to Switzerland being the headquarters of many large international companies, there is a strong industry presence in Switzerland. The companies' for-profit nature makes the IQP and its goals more difficult to align with the goals of the businesses, though not impossible. Companies that we have met with have expressed more interest in sponsoring MQPs than IQPs. The main reason that we have found for the desire to sponsor MQPs has been to gain the international perspective and research experience of the WPI students. A group of four students completing a technical research project could be helpful for Swiss companies. The topic of the MQP is also easier to

explain to Swiss companies than the IQP. It can simply be explained as a bachelor degree design capstone project. Swiss university students complete a bachelor's thesis which is similar to the MQP.

Recommendation: Connect with industry to bring more MQPs to Switzerland

Investigate broadening WPI's reach into Switzerland to find more MQPs. It should be easier to find organizations interested in sponsoring MQPs than IQPs, as they align better with the goals of businesses than nonprofits. Based on our meetings with WPI alumni that live in Switzerland, it will be easier to contact for-profit companies than nonprofits. The majority of the alumni that we met with work in industry, and therefore also have the majority of their contacts with people that also work in industry.

4.5.5 Organizations Recommended to us that would be a good fit for sponsoring IQPs

Through our meetings with alumni and other contacts, we received suggestions of other organizations that may be interested in sponsoring IQPs. Due to time constraints, we were not able to contact or meet with all these organizations. These organizations can be broken up into two types: non-profit organizations and for-profit companies. While for-profit companies generally do not fit the goals of the IQP as well as non-profits, they can still serve as leads to nonprofit organizations, or be interested in sponsoring MQPs. The organizations that have been recommended to us can be found below, broken up into two tables: non-profits and companies. These organizations have not agreed to sponsor any projects, but have been recommended to us through our meetings that they would be worthwhile to contact as they may be interested.

Nonprofit Organizations

Organization Name	**Location**	**Description/Goals**
Red Cross	Geneva*	Protect human live and health, alleviate human suffering
GLOBE CH	Bern	**G**lobal **L**earning and **O**bservations to **B**enefit the **E**nvironment. Better the understanding of dependencies of the Earth as a system.
Technorama Winterthur	Winterthur	A science museum in Switzerland that is focused on interactive exhibits and helping visitors understand science and technology
Swissmem	Zurich	Swiss association of mechanical and electrical engineering industries
Netzwerk Schweizer Pärke	Bern*	The network of Swiss parks. Responsible for preserving the natural landscape of Switzerland and improving the experience of the visitors.
INGCH	Zurich	A nonprofit organization responsible for increasing awareness of the connection of engineering to society.

World Health Organization	Geneva	A subsidiary of the UN responsible for managing diseases, and increasing the overall health of the human race.
United Nations	Geneva	An intergovernmental organizations supporting international cooperation
World Wildlife Fund	Geneva	NGO focused on conservation, preservation and restoration of wildlife and the environment

*Location of main office, but there are other locations throughout Switzerland

For-profit Companies

Name	Location	Description/Goals
Novartis	Basel	A biotechnology and pharmaceutical company
Migros	Zurich*	A large grocery store chain in Switzerland. The company does a lot with sustainability and the community, including operating many public parks
Coop	Basel*	The main competitor to Migros. Coop also does many sustainability efforts for the community and has three main brands focused on a sustainable selling proposition that focus on lowering environmental impacts and optimizing social outcomes in the supply chain.
SBB	Zurich*	The Swiss Federal Railways, Switzerland's state-owned transportation company.
UBS	Zurich	A global financial services company with focus on asset management and investment banking.

*Location of main office, but there are other locations throughout Switzerland

We have met with two of these organizations, INGCH and the Netzwerk Schweizer Pärke (Network of Swiss Parks), and they were both interested in learning more about WPI and the IQP, and how they may be able to get involved in sponsoring projects in the future. They both mentioned that they have projects that they would like to do but don't have the resourses, time or manpower to complete. They believe that collaborating with WPI may be a great opportunity for their organizations. We have given them example project reports, and electronic versions of our sponsor guide and brochure for them to pass along to their colleagues. We referred them both to the project center director for further correspondence.

These are, of course, not the only organizations in Switzerland that may be interested in sponsoring projects, but they can serve as a good place to start finding future projects. From our meetings and discussion with organizations and alumni, we have personal contacts with some of the above organizations. The names and contact information of the individuals at the organization have been given to Dr. Tara Mann as part of our final recommendation.

4.6 General Recommendations for WPI and IGSD

4.6.1 Summary Strategy for Finding Sponsors

We have created a strategy for the Switzerland Project Center to use to find future projects. This strategy (Fig. 17) continues where we left off and takes advantage of both the strong presence of the WPI alumni base in Switzerland and their desire to help WPI and its students.

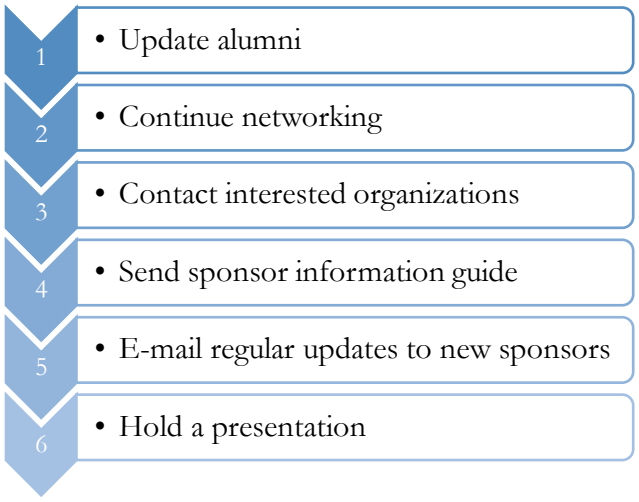

Figure 18: Recommended Strategy

The alumni that we met with greatly appreciated being updated about WPI's activity in Switzerland and enjoyed learning more about what types of IQPs students were completing. Most of the alumni were open to giving us their contacts and making personal introductions when applicable. Leveraging the alumni and university contacts is a successful way to get an introduction to organizations that may be a good fit for sponsoring future projects. Contacting the interested organizations and setting up an in-person meeting gives the opportunity to explain the IQP and its goals while also being able to gauge the interest of the organization. If the organization displays interest, it is recommended that the sponsor information guide be sent to them. It would also be worthwhile to send the brochure and some example project reports to the organization as well so they are aware of the aspect of the IQP from WPI's side (writing a formal report that encompasses all of the background research, methodology, results and findings). It is also recommended that regular updates be sent to new sponsors so that they always know the status of their projects. Also, as discussed in an earlier finding, holding a large final presentation affords the opportunity to turn the final presentations into a networking event to raise awareness of WPI in Switzerland and can serve as a venue in which to invite potential sponsors.

This strategy is one that we believe would be a successful approach to find more sponsors. This continues where we left off in this IQP and takes advantage of the number of WPI alumni in Switzerland and their personal contacts.

4.6.2 The Location of the Switzerland Project Center

It is challenging to identify the best location for the Switzerland Project Center. Switzerland is different from many other GPP locations because projects are located anywhere in the country, rather than being centrally located around one city. Students have often had long commutes (up to 2 hours, each way) to their project sites. This has raised the question if it is better for students to all live together in one central location, or if it would be best for students to live near their project sites. Most student feedback has pointed to the idea of all students living together in one location.

Zurich's central location and size makes it a good option for a location from which to operate the Switzerland Project Center. Within an hour and a half by train it is possible to get to most major cities in Switzerland. It is also an hour and twenty minutes to Konstanz, Germany where goods are cheaper than in Switzerland. The tram and S-Bahn (City-fast train) network is extensive and makes traveling throughout Zurich and its immediate vicinity easy. The Zürich Hauptbahnhof (Zurich main train station) is the largest train station in Switzerland. Because of its size, Zurich also contains many English speakers, making it easy for students and advisors to be able to live in a German-speaking country while knowing little, if any, German. Although it may still result in long commutes for groups not working in Zurich, it provides a central location for groups to travel from.

We also received a recommendation through an interview that Olten may be a possible location for students to live as it is a major rail hub for the SBB (Swiss Federal Railways). From the Olten train station it is less than a 30 minute train ride to Luzern, Basel, Bern and Zurich. The population of Olten is approximately 17, 000 and may not provide the same level of services to students and it may not be as easy to communicate using the English language.

CHAPTER 5: Conclusion & Reflection

Over the course of our project, we have learned a tremendous amount about WPI, the Global Projects Program and especially the Interactive Qualifying Project. We learned about the undefined character of the IQP by seeing how the project topics can vary widely depending on the location and sponsorship. We also learned how the direction of a project center is largely determined by the interests and connections of the project center director. We were surprised, as WPI students, to learn how little we knew about the reasons behind WPI's projects and what makes them distinctive when compared to the programs of other schools.

In reflection, we believe it would be valuable for first-year students to take a required mini-course that explains what the projects are and why they are so important to WPI. This would also expose students to their options of completing the projects off-campus through the Global Projects Program. Through this project, we have found that projects completed through the GPP tend to be of higher quality than the projects done on-campus. Early exposure to the project and GPP may encourage more students to start thinking about going off-campus for their project.

An interesting aspect of the management of WPI's Global Projects Program is that each project center is relatively independent from the others in the types of projects that are completed and how new projects are found. They are connected, however, through the overhead organization of IGSD. We found that each project center director independently created brochures, flyers, informational materials or websites as needed, and there are few standardized marketing materials for finding new sponsors. It may be helpful to have a standard template for promotional and informational materials that could serve as an initial resource for new project centers. Past project sponsors also voiced the desire for a website page where they could receive all the information they would need to know about sponsoring an IQP.

We found Switzerland to be a good location for a WPI project center, but as with any project center, there are cultural differences which will require WPI to take different approaches in finding project sponsors. We have found that there are definitely many organizations that would be interested and able to sponsor future IQPs. Additionally, MQPs could also further the relationship WPI is wishing to create with Swiss universities and industry. Since we have many alumni and contacts in industry, MQPs could be a very feasible way for the Switzerland Project Center to expand as an envisioned Swiss hub for WPI.

For people interested in learning more about WPI's projects, particularly when completed through the GPP, we recommend a few resources. *Shaping our World: Engineering Education for the 21st Century,* compiled by Gretar Tryggvaseon and Diran Apelian in 2012, consists of 14 chapters, each of which is written by different authors. For information about WPI's program, chapter six and chapter eight are good resources. The online article *The Best Laid Plans* written in the spring of 1997 for the WPI Journal provides a comprehensive history of WPI's restructuring of the undergraduate curriculum, and introduces the reader to the main players involved in the process. Our annotated bibliography and summary is also a good resource for anyone wanting to learn more.

The scope of the Interactive Qualifying Project is ever evolving and changing. It has expanded into new territory through the Global Projects Program, and it will continue to grow and expand. More communities will be benefited and more students will have a global experience in their education. The Global Projects Program at WPI as an example of a response to the engineering education reform has impacted many students and communities around the world. Engineers graduating with a global education are prepared to use their knowledge and experiences to improve quality of life for those all over the world.

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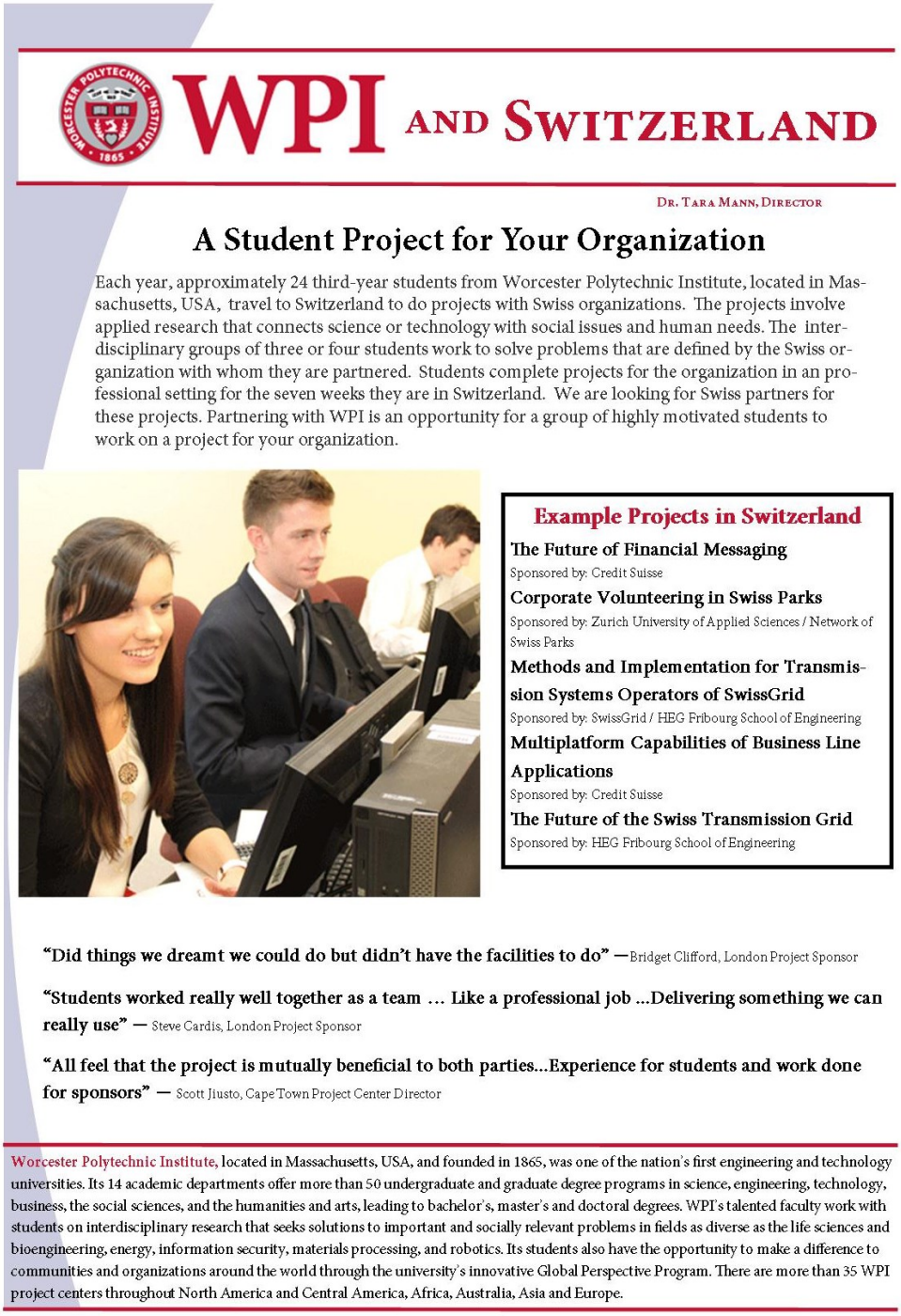
Appendices

Appendix A: Switzerland Project Center Brochure Design



WPI AND SWITZERLAND

DR. TARA MANN, DIRECTOR

A Student Project for Your Organization

Each year, approximately 24 third-year students from Worcester Polytechnic Institute, located in Massachusetts, USA, travel to Switzerland to do projects with Swiss organizations. The projects involve applied research that connects science or technology with social issues and human needs. The interdisciplinary groups of three or four students work to solve problems that are defined by the Swiss organization with whom they are partnered. Students complete projects for the organization in an professional setting for the seven weeks they are in Switzerland. We are looking for Swiss partners for these projects. Partnering with WPI is an opportunity for a group of highly motivated students to work on a project for your organization.

"Did things we dreamt we could do but didn't have the facilities to do" — Bridget Clifford, London Project Sponsor

"Students worked really well together as a team … Like a professional job …Delivering something we can really use" — Steve Cardis, London Project Sponsor

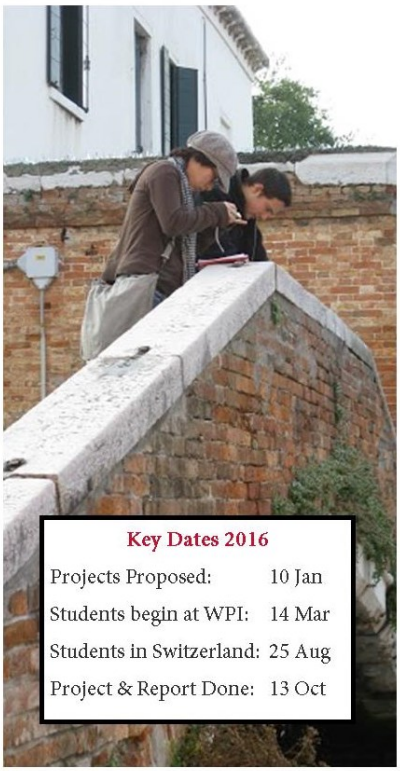
"All feel that the project is mutually beneficial to both parties…Experience for students and work done for sponsors" — Scott Jiusto, Cape Town Project Center Director

Worcester Polytechnic Institute, located in Massachusetts, USA, and founded in 1865, was one of the nation's first engineering and technology universities. Its 14 academic departments offer more than 50 undergraduate and graduate degree programs in science, engineering, technology, business, the social sciences, and the humanities and arts, leading to bachelor's, master's and doctoral degrees. WPI's talented faculty work with students on interdisciplinary research that seeks solutions to important and socially relevant problems in fields as diverse as the life sciences and bioengineering, energy, information security, materials processing, and robotics. Its students also have the opportunity to make a difference to communities and organizations around the world through the university's innovative Global Perspective Program. There are more than 35 WPI project centers throughout North America and Central America, Africa, Australia, Asia and Europe.

Figure 19: Flyer Front

What are the Projects?

The projects, formally called Interactive Qualifying Projects (IQPs), are completed as a graduation requirement, and are evaluated by WPI faculty. Students deliver findings and recommendations through formal reports and oral presentations to Swiss project partners (often nonprofit, municipal, or government agencies) and WPI faculty advisors. The Switzerland Project Center is looking to expand the variety of project partners to include different types of organizations such as NGOs, industry and government.



Key Dates 2016

Projects Proposed:	10 Jan
Students begin at WPI:	14 Mar
Students in Switzerland:	25 Aug
Project & Report Done:	13 Oct

WPI Team

- Third-year students from interdisciplinary backgrounds work in teams of three or four
- Students research and prepare full project plan during intensive seven week preparation on-campus
- Motivated student teams work on your project full-time for seven weeks on-site in Switzerland
- Two full-time WPI professors remain on-site in Switzerland to advise students
- Students present methodology, findings and recommendations in formal report at project completion

Swiss Partner

- Provide project description with achievable expectations for student group
- Support and communicate with project group regularly throughout duration of preparation and project
- Provide location for students to work
- Flexible structure means that Swiss advisors primarily determine their level of involvement in the project

Next Steps:

If you are interested in advising a project, contact Dr. Tara Mann. You will then work with her to write a project description and later determine timing and implementation of the project. For more information, see www.wpi.edu/+global

Contact:

Dr. Tara Mann
Director, Switzerland Project Center
tmann@wpi.edu
+1 508-831-4964

Figure 20: Flyer Back

Appendix B: Interview Form

(Note: the Alumni Interview Form is shown here, the others are nearly identical)

Alumni Interview Form

When Alumni is selected in "Type of Interview", user is routed to this page

Name of Alumni

Location of Meeeting

Date and Time of Meeting

mm/dd/yyyy --:--

Example: 03/05/2013 11:30 AM

Degree received at WPI

- Undergrad
- Graduate
- Both

Understanding of IQP at the beginning of the meeting

This is just based on what it seemed like they understood

	1	2	3	4	5	6	7	8	9	10	
No Understanding	○	○	○	○	○	○	○	○	○	○	Complete Understanding

Understanding of IQP after meeting

	1	2	3	4	5	6	7	8	9	10	
No Understanding	○	○	○	○	○	○	○	○	○	○	Complete Understanding

Were any improvements made on how to explain IQP?

Suggestions for Potential Sponsors

Ideas for industries to sponsor projects

Feedback about use of the term "Sponsor"

- ○ Don't use "sponsor"
- ○ It's is okay to use "sponsor"
- ○ Other
- ○ Does not apply

Comments about using "Sponsor"

Feedback about Project Fees

- ○ Organizations are likely to be willing to pay fees
- ○ Organizations might not be willing
- ○ Other
- ○ Does not apply

Switzerland Project Center

Guide for Project Sponsors

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About Worcester Polytechnic Institute

Founded in 1865, WPI is a private technology-oriented university, located in Worcester, Massachusetts, with around 3,500 undergraduate students, 700 graduate students, and 220 full-time faculty members. WPI students pursue degree programs in engineering, the sciences, the humanities, and management. All WPI undergraduates must complete a third-year interdisciplinary research project called the "Interactive Qualifying Project," or IQP. By working in multidisciplinary teams to address problems related to technology, society, and human needs, students come to understand how their careers will impact, and be affected by, societal structures and cultural values. More than 60% of students go off campus to conduct their IQPs and to coordinate these activities WPI has established "Project Centers" in Europe, Central and North America, Africa, and the Asia-Pacific region.

The Interactive Qualifying Project

The Interactive Qualifying Projects (IQPs), are completed as a graduation requirement, and are evaluated by WPI faculty. Students deliver findings and recommendations through formal reports and oral presentations to their Swiss Project Sponsors and WPI faculty advisors.

The IQP is a general education requirement, not directly related to students' majors. WPI Faculty created the IQP to help students learn to solve real-world problems and make decisions with an understanding of and appreciation for the social and humanistic contexts of their work. The IQP also is central to how WPI students learn to do research, write, and work in teams.

According to the faculty-approved learning outcomes, IQP students will:

1. Demonstrate an understanding of the project's technical, social and humanistic context.
2. Define clear, achievable goals and objectives for the project.
3. Critically identify, utilize, and properly cite information sources, and integrate information from multiple sources to identify appropriate approaches to addressing the project goals.
4. Select and implement a sound approach to solving an interdisciplinary problem.
5. Analyze and synthesize results from social, ethical, humanistic, technical or other perspectives, as appropriate.
6. Maintain effective working relationships within the project team and with the project advisor(s), recognizing and resolving problems that may arise.
7. Demonstrate the ability to write clearly, critically and persuasively.
8. Demonstrate strong oral communication skills, using appropriate, effective visual aids.
9. Demonstrate an awareness of the ethical dimensions of their project work.

Approved by the WPI Faculty in October 2006.
The IQP is an opportunity for significant intellectual and professional development that, done well, prepares WPI graduates broadly for successful and satisfying lives and careers.
(from http://www.wpi.edu/academics/igsd/iqplea75.html)

Project Implementation

Project teams are composed of competitively selected students of science, engineering, management and the humanities who work on-site to solve a key problem for your organization after a carefully monitored period of preparation in the U.S. The outcome of their work is a fully documented professional report containing complete results and recommendations as well as a high quality public presentation of the highlights of their findings suitable for a broad audience.

Project teams operate over a fourteen-week period. During the first seven weeks, teams of three or four students work in the U.S. with their faculty advisors to define the problem, conduct background research, and identify appropriate research methods to address the problem. The teams communicate regularly with your organization's liaison via telephone and/or e-mail. The preparation period includes training in survey and interview techniques, report organization, oral presentation, and other skills required for professional project execution.

During the second half of the fourteen-week period, student teams operate full-time (40 hours/week) on site to complete their project assignment under the close scrutiny of two WPI faculty advisors. The faculty advisors meet weekly with your liaison and the project team to review progress and future plans. Weekends and evenings are devoted to report development (data analysis, draft recommendations, practice presentations, etc.) with the faculty advisors. The project team concludes its effort with a public presentation of results and submission of a detailed written report.

What WPI Provides

The benefits of hosting a project include:

- Over 1600 person-hours of effort from an enthusiastic, well-prepared research team of 3-4 third year university students
- An opportunity for your organization to complete an important task currently languishing for lack of additional staff and resources
- Supervision by WPI faculty at every stage of the project process, during both preparation and project implementation in Switzerland.
- Professional documentation and presentation of the project results and recommendations.

Your Role

WPI expects that project hosts will be able to provide:

- A description of a problem of suitable scope that it can be completed in 14 weeks (7 weeks preparation and 7 weeks on-site) and meets the needs of the project host and the educational needs of the student and WPI.

- A place for the students to work and access to the information, equipment, and facilities needed for the project, including computer, printer, and internet access, if at all possible.
- A commitment from someone at the organization who can serve as the project liaison and provide guidance in consort with the WPI faculty advisors. The liaison should be able to communicate with the students before they arrive by e-mail and then be available to meet with them and their advisors on a regular basis once they are in Switzerland.
- Modest support for direct project-related expenses, such as any extraordinary travel expenses (not daily commuting), or any necessary materials and supplies. Since the students are working for academic credit, they are not employees and are not paid by the project host. Students must pay for their own airfare, housing, meals and commuting transportation.

Timeline of Project

The tentative timeline for projects for the Academic Year 2016-2017 is below:

January 2016 – Projects Proposed

What you should expect: Collaborate with Tara Mann to develop a detailed project description which will outline the project and the students' objectives.

February 2016 – Projects Finalized

What you should expect: Final notice on whether or not your project will be done this year, final project description submitted

March 2016 – Student Teams Chosen

What you should expect: Notification of Student team members, introduction e-mail from students and Skype meeting request.

March-May 2016 – Student Preparation/Research at WPI

What you should expect: Periodic communication with students to provide guidance on research and the methodology they will be developing. During this time period, students will be taking a preparation class where they will be doing extensive background research on the project topic and developing the methods they will use to complete their project when they arrive in Switzerland.

May 2016 – Project Proposal

What you should expect: Students will send you a copy of their formal project proposal which they developed over the past months. This will detail their background research as well as their planned methodology for completing their project in Switzerland.

May-August 2016 – WPI Students on Summer Break

What you should expect: Minimal communication with students during summer break. They should contact you to set up an initial meeting time when they arrive in Switzerland.

August 2016 – Students arrive in Switzerland

What you should expect: Students and their WPI faculty advisors will be arriving in Switzerland. Initial meetings should be on 25 August 2016.

August-October 2016 – Students Complete Projects

What you should expect: Students will complete their projects with your guidance and the guidance of the WPI faculty advisors. Weekly meetings will be held with advisors, sponsors and students to assess progress. Final presentations will be held at the end of the project term and your project team will submit their findings and recommendations in a report to you and their advisors.

2016 IQP Calendar

MARCH						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

APRIL						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

MAY						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

JUNE						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

JULY						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

AUGUST						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

SEPTEMBER						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

OCTOBER						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

LEGEND
Student Preparation
Summer Break
Students in Switzerland

Example Project Descriptions

Multiplatform capabilities of Business Line Applications
Sponsor: Credit Suisse
Employees are mobile and are using smart phones and tablets for their daily work. More powerful tablets and E-Books will replace today's notebooks and laptops over time. Consumer applications are typically provided for multiple platforms (Android, IOS, Windows Mobile) using cross platform technologies such as HTML5 or developing native apps for multiple platforms. In contrast, business-line applications (ones that are critical to the internal operations of a business) are often built with RIA technologies such as Silverlight, JavaFX, and Flash. Providing such applications on mobile devices or tablet like computers is expensive; maintenance and testing are not affordable. Xamarin is a technology that promises to solve this problem for business line applications. Initial investigations into using it are promising; however, several questions remain regarding the surrounding IT process needed to migrate business apps over to Xamarin.

This project will work on this process through the following tasks:

- Define the migration process for business line applications onboarding in a multi-platform capable development environment
- Explore the lifecycle and maintenance process of multi-platform business line applications
- Investigate the release and deployment process of multi-platform business line applications
- Define the delivery and operating model of a business line application
- Outline the required tools and infrastructure to support distributed development teams in providing services for multi-platform business line applications.

Corporate Volunteering in Swiss Parks – Benefits and Market Adaptations
Sponsor: Swiss Parks Network
Swiss Parks of National Importance help to protect and enhance exceptional natural habitats or landscapes of outstanding beauty. At the same time, these parks promote the sustainable economic development of the regions concerned, as well as allowing visitors to experience nature and offering environmental education. In 2014, five national and international companies were involved in the "Corporate volunteering in Swiss parks" project. Their employees volunteered for up to three days in different parks and performed important services in terms of nature conservation and landscape maintenance. Special value was placed on environmental education, team experiences and catering using local food specialties from the park. These volunteer-days were ecologically important and also created added (economic) value for the rural park areas.

This IQP will explore ways to improve and increase the number of participants in the Corporate Volunteering Program in the Swiss Parks.

Questions to explore include:

- What motivates companies to book a corporate volunteering program?
- What are the benefits for the parks (besides ecological impact and added economic value)?
- What special demands do Anglo-Saxon companies (mostly US) have and how could the program be adapted, to meet them?

The groups will examine the questions in cooperation with different parks and companies (to be defined). The results will be developed into a concept for volunteering in Swiss parks that will include recommendations for future actions.

Innovation and Know-How Management in Operational Training: Methods and Implementation for Transmission Systems Operators of SwissGrid
Sponsor – Swissgrid and HES-SO

As an independent transmission system operator, Swissgrid is responsible for the expansion planning, operation and financing of the entire Swiss high-voltage grid. Switzerland has the most reliable electricity grid in Europe. Swissgrid controls all transmission system substations using state-of-the-art technology and a high level of automation. Swissgrid's Transmission Systems Operators (TSOs) have the responsibility and authority to implement real time and coordinated actions to ensure the stable and reliable operation of the synchronized UCTE power systems. This requires continuous co-ordination between national and regional control centers and requires the involvement of large groups of specialists with the support of new technologies. The TSOs in control centers are dealing with different situations / conditions and have to make decisions and communicate these with the wider group. The appropriate training of those people is a crucial element of the security of the whole power system.

In this IQP students will investigate best practices in continuing operational training for TSO professionals. The learning environment should continuously collect any new information and any lesson learnt should be quickly reflected into operations under the condition of limited availability of operators and shift-workload.

Some questions that would be interesting for Swissgrid are:

- How can the existing or new knowledge be shared between Operators in the same control center and among several control centers?
- How might Swissgrid transfer existing or new Knowledge from back-Office to the real-time operations and back again?
- How can theoretical and practical trainings be made more attractive?
- Are there any innovative methods and tools in other sectors that could be implemented in Transmission System Operators (TSOs) in a collaborative environment?
- How do other TSOs or related businesses address this issue? Best-practice survey?
- What are the implementation possibilities at Swissgrid's working environment?

Example Past Projects

Project Title: Facilitating Social Interaction between Visually Impaired and Sighted Children through Toys and Games
Location: Copenhagen, Denmark
Sponsor: Videncenter for Synshandicap
Abstract: This project examines different approaches to designing toys and games which promote social interaction between blind and sighted children. Onsite research includes literature reviews, classroom observations, a parent workshop and interviews in Copenhagen, Denmark, in collaboration with the Videncenter for Synshandicap. We conclude that the play environment is equally as important as toys and games, and that the best approach is one in which play resources are developed specifically for blind children, using techniques such as audio and tactile adaptations.
Link to Full Report: http://www.wpi.edu/Pubs/E-project/Available/E-project-051506-100755/unrestricted/06E030I.pdf

Title: Business Biking in Croydon
Location: London, England
Sponsor: Borough of Croydon
Abstract: In 2010, The Mayor's Transport Strategy was released by Transport for London, a government agency dedicated to improving transportation in London. The strategy sets out several initiatives to promote London's transport over the next 20 years, including enhancing residential quality of life and reducing the city's impact on the environment. It also focuses on the transport objectives of London's respective boroughs and how they can achieve the same at a local level, stressing that the boroughs should identify key connections between local centers and other forms of transportation, such as bus and Tube stations. As London begins to improve its cycling culture, many Boroughs are looking for ways to increase bicycle usage. One such Borough is Croydon, where its government Council is seeking to establish a pool bike program. Currently, the Council has been using Zipcars as a reliable mode of transportation for council staff. The Council believes that a pool bike scheme would reduce the number of trips that people take with Zipcars. This reduction would improve air quality and the health of Council staff members, while reducing transportation costs. As the Council began to research a possible pool bike scheme, a series of issues emerged with translating theory into practice. The Borough of Croydon faced the problem of how to make a bicycle sharing program work efficiently, safely, and economically. There were many logistical barriers to overcome such as facility access, administration of the program, and liability and insurance needs. Our goal for this project was to work with the Croydon Council to create guidelines and recommendations for developing a bike-sharing program for the Council staff.
Full Project Report: http://wp.wpi.edu/london/files/2014/06/Business_Biking_in_Croydon.pdf

Title: The Future of Financial Messaging
Location: Zürich, Switzerland
Sponsor: Credit Suisse
Abstract: Financial telecommunication governs the exchange of information between the computer systems of banks, their clients and other financial institutions. The purpose of this project was to inform a major Swiss bank, Credit Suisse, of market trends and future potential in the sector of financial messaging systems. By interviewing internal and external clients of Credit Suisse, financial software vendors, and competing banks, we identified potential future improvements to Credit Suisse's current financial messaging system. On a larger scale, this study investigated the impact of changing technology on the marketplace and the financial industry. After analyzing our interview and survey results we developed a list of major findings and a set of recommendations regarding 'Big Data,' infrastructure development, the adoption of the ISO 20022 international standards, and the process and impacts of organizational change.
Full Project Report: https://www.wpi.edu/Pubs/E-project/Available/E-project-050114-081651/unrestricted/The_Future_of_Financial_Messaging.pdf

Title: Benefits of Partial Road Closures: An Analysis of the Effects on Quality of Life from the Nørrebrogade Road Closures
Location: Copenhagen, Denmark
Sponsor: Miljøpunkt Nørrebro (Agenda 21)
Abstract: Nørrebrogade was a busy street in Copenhagen, Denmark that suffered from excessive traffic congestion, air and noise pollution. In October 2008 the City of Copenhagen began several experimental road segment closures on Nørrebrogade. The goal of this project, sponsored by Miljøpunkt Nørrebro (Agenda 21), was to investigate changes in quality of life that have resulted from the trial closures on Nørrebrogade and was accomplished through a traffic flow analysis, motor vehicle emissions calculations, noise level calculations, and surveying and interviewing stakeholders. The team determined that traffic had been reduced on Nørrebrogade by 50-80%, traffic-related pollution emissions were reduced by 35-80%, and noise levels were lowered by 3-6dB (50–75%)along Nørrebrogade. Additionally, surveys revealed an increase in perceived safety and a calmer atmosphere on Nørrebrogade, though some businesses claimed to be suffering due to the closure. Overall, the closure has positively affected the health-related quality of life of people on Nørrebrogade.
Full Project Report: http://www.wpi.edu/Pubs/E-project/Available/E-project-051010-145425/unrestricted/Agenda21D10_Benefits_of_Partial_Road_Closures.pdf

Title: Study to Evaluate Pedestrian Systems in Venice
Location: Venice, Italy
Sponsor: Assessorato alla Mobilita [Venice Department of Mobility]
Abstract: Each year Venice is impacted by the large number of tourists that travel to the city for its famous celebrations and landmarks. Consequently, the number of pedestrians has been rapidly increasing and the mobility of the streets has been compromised. Beginning in 2007, data of the number of pedestrians on bridges and street segments has been collected by Worcester Polytechnic Institute students. Our project sought not only to continue this data collection, but also analyze how the numbers of pedestrians impact the streets. The pedestrian data we collected will serve several purposes. First, this data provides general information and the understanding of traffic flow on the streets. Second, the data collected will serve as a baseline to later determine the effect the installation of a new public tramline will have on the city. Our team also worked to model the infrastructure of the streets through the creation of GIS map layers as well contributed data to a Pedestrian Model. The information about the infrastructure of the streets was entered into a database accessible to the public through Venipedia pages, which can be referenced in the future to understand how the pedestrian system changes over time.
Full Project Report: http://www.wpi.edu/Pubs/E-project/Available/E-project-121412-161950/unrestricted/Streets_Final_Paper.pdf

Appendix D: Annotated Bibliography Sources

Author	Year	Title
S. Ambrose	2013	Undergraduate Engineering Curriculum: The Ultimate Design Challenge
A. Bielefeldt, K. Paterson and C. Swan	2009	Measuring the Impacts of Project-Based Service Learning
S. Carlson	2007	A Global Approach to Engineering
F. Carrera, D. DiBiasio and N. A. Mello	2003	Undergraduate Engineers Get Credit for Saving Venice
T. Collins	1978	A Radical Experiment in Teaching
P. Davis, D. DiBiasio, W. Durgin, L. Schachterle and R. Vaz	2004	Achieving Learning Outcomes Through Project-Based Education
C. Demetry and R. Vaz	2002	International Project Experiences: Assessing Impact on Students' Educational and Personal Development
D. DiBiasio and N. Mello	2004	Multi-Level Assessment of Program Outcomes: Assessing a Nontraditional Study Abroad Program in the Engineering Disciplines
D. DiBiasio, N. Mello and F. Carrera	2004	A Multilevel Assessment Process for Student/Faculty Teams in a Project-Based Learning Environment
W. W. Durgin and E. A. Parrish	1998	Redesigning engineering education
W. W. Durgin and D. N. Zwiep	2001	Global Projects Prepare WPI Students for the 21st Century
M. B. Elmes, S. Jiusto, G. Whiteman, R. Hersh and G. T. Guthey	2012	Teaching Social Entrepreneurship and Innovation From the Perspective of Place and Place Making
M. Elmes and E. Loiacono	2009	Project-Based Service-Learning for an Unscripted World: the WPI IQP Experience
E. A. Groll, C. M. Krousgrill, P. H. Meckl and E. D. Hirleman	2006	Experiences with multi-national, multi-semester design team projects
H. Hakim	1991	Global Perspective Program: WPI's Response to Global Challenges
P. H. Hansen	1995	International education and sustainable development: an American experience in Bangkok, Venice and Guayaquil
L. Harrisberger and et.al.	1976	Restructuring Undergraduate Science Education. A summative Assessment by the NSF-Worcester Polytechnic Institute Project Advisory Committee Constituted from 1972-1975
G. W. Hazzard	1975	For the Technological Humanist: The WPI Plan
A. Heinricher, J. Miller, L. Schachterle, N. Kildahl, V. Bluemel and V. Crawford	2002	Undergraduate Learning Portfolios for Institutional Assessment
S. Jiusto and D. DiBiasio	2006	Experiential Learning Environments: Do They Prepare Our Students to be Self-Directed, Life-Long Learners?
S. Jiusto and R. Hersh	2009	Proper homes, toilets, water and jobs: a new approach to meeting the modest hopes of shackdwellers in Cape Town, South Africa

S. Jiusto and M. Kenney	2014	Hard rain gonna fall: Strategies for sustainable urban drainage in informal settlements
S. Jiusto, S. McCauley and J. Stephens	2013	Integrating Shared Action Learning into Higher Education for Sustainability
S. Jiusto and R. Vaz	2015	Designing for Impact: A Model of Community Engagement for Sustainable Development
F. Looft	2007	Capstone Design at WPI
F. J. Looft	2010	The WPI Capstone Project: Evolving Off-Campus and International Experiences
F. Looft and Y. Rong	2011	The Capstone Project: An Integrated Experience
F. Lutz and L. Schachterle	2010	Projects in Undergraduate Engineering Education in America
Y. H. Ma, L. Schachterle and J. F. Zeugner	1995	WPI Projects Globalize Engineering Education in the Pacific Rim
N. Mello	2001	How One Institution Provides a Global Perspective for Engineers
N. A. Mello	2005	Preparing Faculty for a Global Experience
N. Mello, D. DiBiasio and R. Vaz	2007	AC 2007-500: Fulfilling ABET Outcomes by Sending Students Away
A. Parkinson	2007	Engineering Study Abroad Programs: Formats, Challenges, Best Practices
J. M. Perry and N. E. Sondak	1978	The project experience in undergraduate computer science education
S. Richter, J. Brown, J. Miller and D. DiBiasio	2002	Engaging High School Students in Traditional Science, and Getting College Students Interested in Teaching- Is it all Possible?
Y. Rong, G. Tryggvason and R. Vaz		MQP in China: Doing Projects and Beyond
L. Schachterle	1998	Outcomes Assessment at WPI: A Pilot Accreditation Visit Under Engineering Criteria 2000
L. Schachterle	1999	Outcomes assessment and accreditation in US engineering formation
L. Schachterle and O. Vinther	1996	Introduction: The role of projects in engineering education
L. Schachterle and M. Watkins	1992	The WPI Interactive Qualifying Project- A Model for British Engineering Education?
R. F. Vaz and N. A. Mello	2000	The WPI Global Perspective Program: Preparing for Assessment and ABET 2000
R. F. Vaz and P. C. Pedersen	2002	Experiential Learning with a Global Perspective: Overseas Senior Design Projects
R. F. Vaz, N. A. Mello and D. DiBiasio	2011	Global Citizenship: Students Solving Real Problems Around the World
R. F. Vaz	2012	Designing the Liberally Educated Engineer
R. Vaz and C. Demetry	2010	Recruitment, Mentoring, and Development of STEM Faculty to Lead International Programs
A. M. Wyglinski, R. F. Vaz, J. A. McNeill, D. R. Brown III and F. J. Looft III		Conducting Electrical and Computer Engineering Capstone Design Projects Abroad: The Limerick Experience

Appendix E: Annotated Bibliography Summary

WPI's Approach to Global Learning: The Global Projects Program and Interactive Qualifying[1] Project

May 2015

A Brief Review of Literature

Abstract: Since the creation of the Global Projects Program (GPP) at Worcester Polytechnic Institute (WPI), many journal articles, conference papers, and book chapters have been written about the creation of the program, the nature and outcomes of the projects, and the assessment and improvement of the program. This literature review synthesizes the most important themes of the global program at WPI and how it compares to global programs at other universities. This summary describes the relationship between the two required qualifying projects, the Interactive Qualifying Project (IQP) and Major Qualifying Project (MQP), and the GPP. It also provides information for those interested in starting or growing a project center.

Introduction

This review covers about fifty sources written about engineering education, the WPI Plan, the Global Projects Program, and the required WPI projects. The majority of the sources focus on the third-year project, the Interactive Qualifying Project. These sources, many of which are written by WPI faculty, range from the 1970s when the WPI Plan was created to current day conference articles about the growth of the GPP and IQP. This review discusses both the IQP and GPP, which are each their own entity, but are closely intertwined. The GPP encompasses all projects that are completed off-campus, including MQPs and humanities projects. The IQP is a required project that can be completed on-campus or off-campus. When the IQP is completed off-campus, it is completed through the GPP.

This literature review was created in companion with an annotated bibliography as part of an Interactive Qualifying Project completed in Switzerland in 2015 titled, "Diversifying WPI Projects in Switzerland". The review was constructed with the goals of the project in mind, therefore the focus

[1] The complete literature review document can be found in WPI's library catalogue. The complete document includes the works cited of the sources used specifically in this document.

of the review is on defining the programs and understanding the history and development of the GPP and particularly the IQP. The annotated bibliography is available through WPI's library catalogue, and the IQP report is available on WPI's project database.

Engineering education reform: The drive for socially conscious, globally literate engineers

Since the 1970s there has been a continuous push for engineering universities to teach engineering students about the impact their future work will have on society. The challenges engineers face increasingly involve social aspects in addition to technical problems. As the world has become more interconnected, it has become increasingly important for engineers to have exposure to global education that will allow them to work and communicate around the world (Schachterle & Watkins, 1992, p. 49; Vaz, Mello, & DiBiasio, 2011, p. 77; Vaz, 2012, p. 8).

New Accreditation Board for Engineering and Technology (ABET) requirements further expanded the reform. In 2000, ABET instituted a new requirement that, "graduates understand the impact of engineering solutions in a global and societal context". Universities took different strategies to comply with this new requirement, many implementing in-classroom global learning while others creating international programs (DiBiasio & Mello, 2004, p.238; Mello, DiBiasio, Vaz, 2007; Pedersen & Vaz, 2002; Vaz & Mello, 2000).

Universities have been trying to find a sustainable way to teach students about the global impacts of engineering solutions. The structured academic requirements in typical engineering programs make involvement in global programs challenging. In many cases, global programs are offered during the summer, or cause a delayed graduation (DiBiasio and Mello, 2004, p. 238). However, universities have been increasingly developing a wide range of programs that would give students global exposure.

The University of Massachusetts Lowell, for example, has integrated project-based service learning into existing classes. Students work on specific problems aimed to help a community while they are learning technical material in classes (Bielefeldt, Paterson, & Swan, 2009, p. 3). Iowa State also has a large global program which sends engineering students abroad. They offer an exchange program as well as a summer program where engineering students can take courses or complete an academic project overseas (Parkinson, 2007). Purdue University offers a program which integrates learning a second language with an internship and coursework abroad. Twelve to fifteen students participate in this program each year (Parkinson, 2007).

Development of WPI's global program: The Global Projects Program

In the early 1970s WPI restructured its undergraduate curriculum through the institution of the WPI Plan which moved WPI from a traditional semester schedule to a quarter system[2] and introduced a project-based curriculum (Collins, 1978, p. 48; Hansen, 1995, p. 252). The seven week quarters that replaced the semesters allow students to complete the required projects without extending their graduation date.

The WPI Plan outlined three projects which became graduation requirements for students. In the early years of implementing the WPI Plan, these projects evolved into the Humanities and Arts Requirement, the Interactive Qualifying Project, and the Major Qualifying Project (Durgin & Parrish, 1998, p. 63; Hazzard, 1975, p. 19). The Humanities and Arts Requirement gives students an opportunity to explore an interest in a field such as art, music, history, or literature. The Interactive Qualifying Project connects science and technology and the Major Qualifying Project is a senior capstone in the students' major of study (Looft, 2010; Looft & Rong, 2011). Students have the choice to complete these projects at WPI or off-campus through WPI's Global Projects Program. In 1974, WPI opened its first residential project center in Washington, DC. Soon after, the first international center was opened in London. Since the development of the early project centers, the program has grown rapidly, especially in the past decade and currently allows students to choose from 39 locations in 25 countries. Students interested in completing their project off-campus must complete an application process and be accepted into the program.

The Global Projects Program was first established as the Global Perspective Program in the late 1980s to support students completing their projects off-campus (Durgin & Parrish, 1998, p. 64; Hakim, 1991; Ma, Schachterle, & Zeugner, 1995, p. 112). This was important in developing WPI's belief that gaining a global perspective is achieved more thoroughly through traveling abroad rather than classroom learning (Carrera, DiBiasio, & Mello, 2003). Since the creation of the program, student involvement and project center offerings have increased rapidly.

The Global Projects Program is based on the theory of situated learning. Situated learning puts students in an environment that mirrors that of a professional setting (DiBiasio, Mello, & Carrera, 2004). The projects were designed on the concept of "learning by doing" (Mello, DiBiasio, & Vaz, 2007). Learning by doing is an integration of theory in practice, which is most effectively

[2] WPI functions on a schedule of four, seven-week quarters rather than two, fourteen-week semesters.

done by sending students off-campus (Ambrose, 2013, p. 20). By participating in the program, students learn to work in groups, interact with professionals, and give oral presentations as well as written reports.

Through the Global Projects Program, WPI has sent more engineering students abroad than any other university (Parkinson 2007). Because all students are required to do the projects, whether through the GPP or on-campus, it is popular for students to travel abroad (Vaz & Pedersen, 2002). The growing involvement of the program is an indicator of the importance of the projects to WPI students (Vaz et al., 2011, p. 77).

The complexity of the Global Projects Program: Defining the Projects

It is challenging to define the type of program that the projects fall into because the Global Projects Program encompasses a wide variety of diverse projects. Bielefeldt, Paterson, and Swan (2009) describe the projects done through the Global Projects Program at WPI as project-based service learning (Elmes & Loiacono, 2009). Project-based service learning (PBSL) is a learning style in which students gain a learning experience while working on a project for a community. Although projects done through the GPP may fall into the category of PBSL, project-based service learning does not completely define the projects. The projects done through the Global Projects Program, specifically the Interactive Qualifying Projects, have a more collaborative focus than is often characteristic of PBSL. The projects are done with the community rather for the community.

Richard Vaz, Natalie Mello, & David DiBiasio describe the same projects as a combination of, "Project-based experiential learning, service learning, undergraduate research, and study abroad" (Vaz et al. 2011, p. 78). This unique combination of several types of global programs has been defined by Jiusto, McCauley and Stephens (2013) as Shared Action Learning (SAL) (Jiusto & Vaz, 2015, p. 27-4). Shared action learning is the collaborative learning that takes place when students, community members and faculty work together on community projects. Many IQPs done in Cape Town, South Africa in the scope of sustainability fall into this Shared Action Learning category (Jiusto & Kenney, 2014, p. 3) Although many projects are done off-campus and internationally, the concept of shared action learning is applicable on-campus as well as abroad (Jiusto & Kenney, 2015, p. 4). The educational component of the experience is also described in the category of experiential or service-learning (Elmes, Jiusto, Whiteman, Hersh, Guthey, 2012).

The Interactive Qualifying Project: Sending 70% of WPI Juniors off-campus

The Interactive Qualifying Project, typically done during the third year, is the most common time for WPI students to go off-campus. Since the introduction of off-campus residential project centers, the global IQP program has grown rapidly. Over the past six years, the number of students accepted into the off-campus IQP program has increased by 109%, from 357 in 2009-2010 to 745 in 2015-2016 (IGSD Statistics, 2015). During this same time period, the number of IQP project centers has grown from 13 to 27 (See Figure 1). There has been particular growth in project centers in the developing world, driven by students' interest in completing projects in those locations (Vaz et al., 2011, p. 88). About 70% of third year students currently travel off-campus to complete their project.

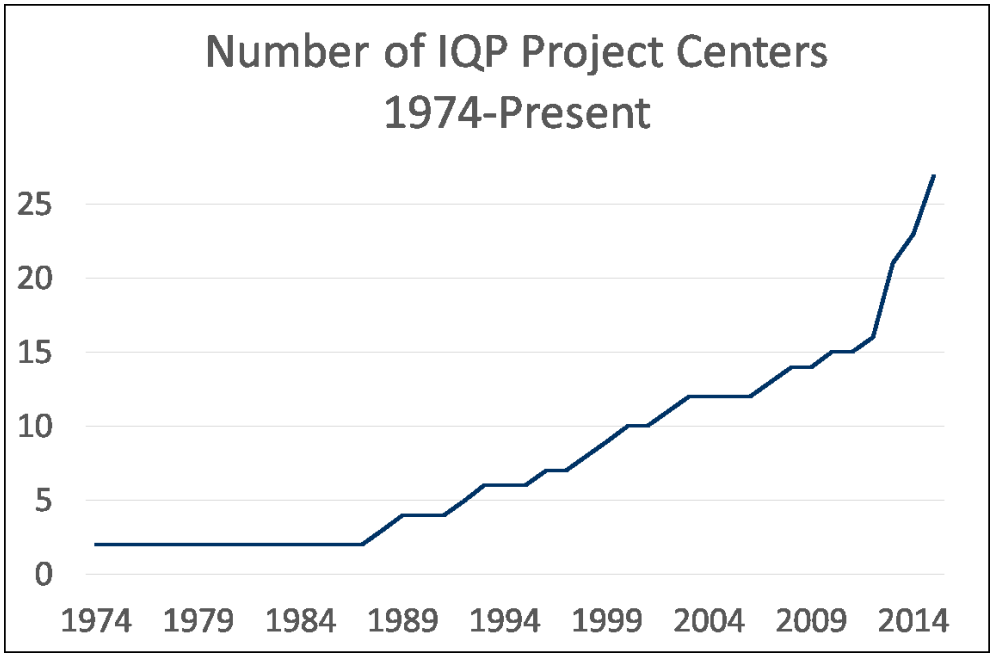


Figure 21: Growth in IQP Project Centers

The Interactive Qualifying Projects, when done off-campus, are completed in small interdisciplinary groups of students with two WPI faculty advisors on-site for guidance. The projects

are defined by local organizations at the project site, and students work in collaboration with the organizations to find solutions to real-world problems with social or cultural components. Through this experience students are exposed to a new culture and learn how to live in an unfamiliar environment. The project is worth academic credit of three courses during the on-site phase, and 1.5 courses during the preparation phase (Looft, 2007; Richter, Brown, Miller, & DiBiasio, 2002). The preparation phase takes place before students travel off-campus and provides a cultural education of the location they will be traveling to (Durgin & Zwiep, 2001, p. 4).

Program assessment and sustainability: Scaling and maintaining the program

Global programs for engineering schools tend to be difficult to scale and maintain. This is because traditional engineering programs tend not to be flexible, in order to fit all required courses (Carlson, 2007). WPI's Global Projects Program is an example of a global program for engineering students that has succeeded in continuously growing since its development. Its success is largely due to the "institutional commitment" of the faculty, administration and students at WPI. The involvement of a variety of faculty rather than a few key players has allowed the program to continue to grow and be passed down to new leaders (Vaz et al., 2011, p. 81). There is a high importance placed on the projects at WPI, and graduating students with project experience is "at the center of the curriculum" (Vaz et al., 2011, p. 78).

In order to continuously improve the Global Projects Program, and ensure that its existence is secured for the future, the program is formally evaluated. Individual projects are assessed at the end of an academic year. Students evaluate their project and advisors at the completion of the on-site term as well. An external review of the projects is also completed each year, and the groups with the best projects receive awards (Davis, DiBiasio, Durgin, Schachterle, & Vaz, 2004; DiBiasio & Mello, 2004, p. 250).

As the GPP has grown, programs have been developed to manage student and faculty safety while off-campus. A risk-management team was instituted to create programs and resources to minimize risk. All students and faculty going off-campus receive handbooks that contain location-specific safety information and tips. Faculty receive training about the non-academic issues that can arise when advising off-campus Students also participate in an orientation prior to travel where they taught about health, safety, drug-use, medical insurance, and sexual harassment (Mello, 2001; Mello 2005).

Starting or developing a WPI project center

In recent years, new project centers have been developing rapidly, but there is little literature written about the experience of starting and growing a new project center. However, information can be obtained via interviews with the faculty who opened the center. The limited literature available describes the opening of the first international project center in London. London was chosen as the first international IQP site because WPI had previous contacts there from an exchange program. WPI faculty contacted fifteen organizations, fourteen of which were British. All fourteen British organizations were interested in sponsoring projects. The program was set up so that students paid their standard tuition to WPI and their living expenses while WPI paid for two professors to travel with the students (Schachterle & Watkins, 1992).

Conclusion

Whether completing the IQP, the MQP or the Humanities and Arts requirement, WPI students are completing projects off-campus in large numbers. WPI's Global Projects Program has aimed to prepare students to become socially and globally conscious engineers. The growth of the program has allowed students to work in communities around the world.

Appendix F: Student Biography Template

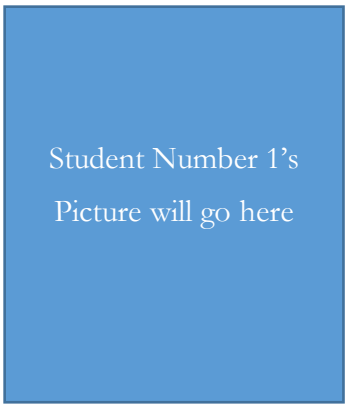
Your Team

Student Number 1

Major:

Minor(s):

Class of ____



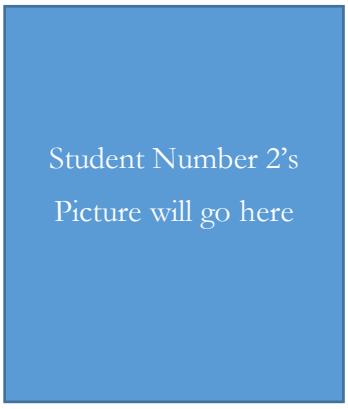
Short Biography of student will go here. The student can write his/her own biography and it should contain some interesting facts as well as academic information and extracurricular activities at WPI. It should be about 100 words long.

Student Number 2

Major:

Minor(s):

Class of ____



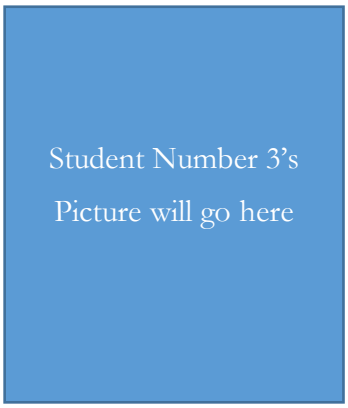
Short Biography of student will go here. The student can write his/her own biography and it should contain some interesting facts as well as academic information and extracurricular activities at WPI. It should be about 100 words long.

Student Number 3

Major:

Minor(s):

Class of ____



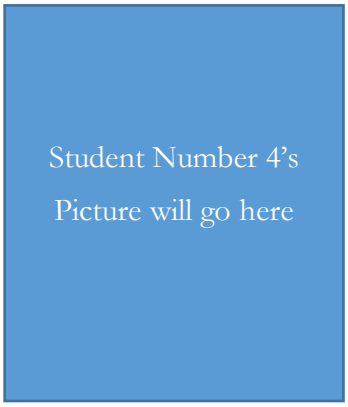
Short Biography of student will go here. The student can write his/her own biography and it should contain some interesting facts as well as academic information and extracurricular activities at WPI. It should be about 100 words long.

Student Number 4

Major:

Minor(s):

Class of ____



Short Biography of student will go here. The student can write his/her own biography and it should contain some interesting facts as well as academic information and extracurricular activities at WPI. It should be about 100 words long.