Opportunities for WPI in Washington, D.C.

An Interactive Qualifying Project
Submitted to
Delphos International
And the faculty of Worcester Polytechnic Institute
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Degree of Bachelor of Science

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Abstract

The purpose of this project was to determine ways to raise awareness of the opportunities available to WPI in the Washington, D.C. area. The team's focus was to locate federal funding opportunities for WPI's faculty, and to create relationships with foreign embassies where WPI currently has project centers. A database was created, detailing opportunities in D.C. to facilitate the identification of funding for WPI faculty. Recommendations were created to outline greatest potential mutual benefits between WPI and agencies. Visits occurred with officials at the South African and Thailand embassies. The team created, and presented pamphlets outlining student projects completed in these countries. The embassy visits could lead to collaboration between WPI and these countries in the future.

Acknowledgements

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Executive Summary

Since 1865, Worcester Polytechnic Institute has been a private technical university focused on learning through theory and practice. WPI's students complete a rigorous curriculum that includes two different project experiences, the IQP and MQP. These projects can be conducted at WPI's project centers all across the world. WPI also sponsors faculty research projects being completed in top-notch facilities leading to new discoveries and technologies.

To help WPI compete in an increasingly competitive academic world, the objectives of this project are as follows: to identify agenda alignments between WPI and government agencies; to create a knowledgebase detailing opportunities in the Washington, D.C. area to facilitate WPI faculty research proposals; to create a larger global presence by emphasizing the meaningful projects WPI students are completing to certain embassies; and to strengthen relationships with government agencies through alumni contacts.

Methods

- Case Studies: Universities
  - Northwestern University
  - Rensselaer Polytechnic Institute
  - University of Maryland: College Park
- Background Research: Government Agencies
- Database and Software User-interface: Agency Programs
- Survey: WPI Faculty Research
- Embassy Visits: South Africa, Thailand
- Recommendations to WPI faculty and staff

Case Studies

The results from the university case studies indicate that other universities have great success at obtaining funding from the federal government. These universities can be models for schools such as WPI because of the successful methods they have used. Even though the schools themselves are larger and have more faculty members, proportionally their faculties are still showing greater success than faculty at WPI, and though the school has had some success, there is much more that can be done.

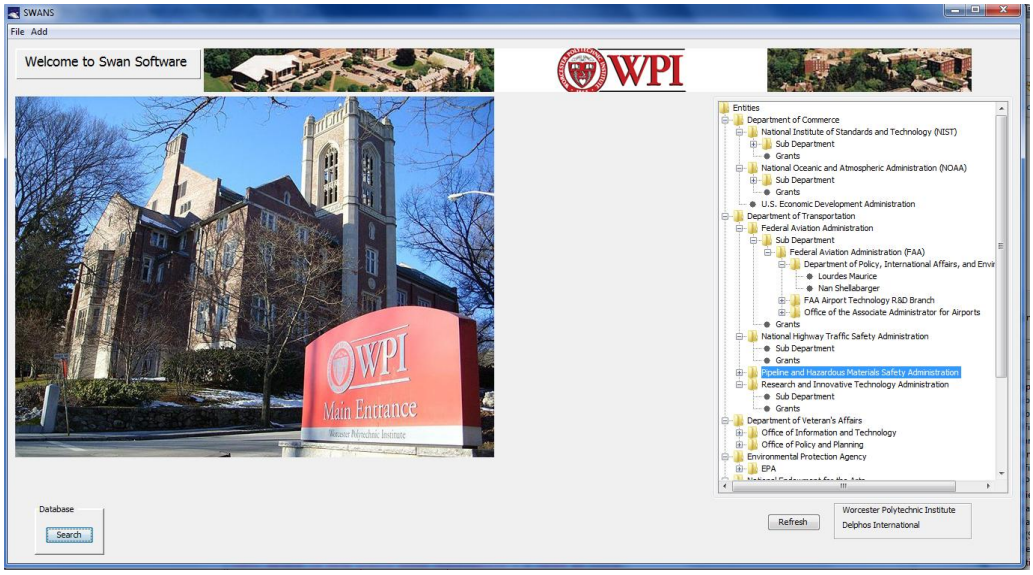
Agency Research

The major research portion of the project was the US federal agencies: organizing and classifying them by their departments, divisions, and offices, along with the corresponding programs and grants available for academic research. Contact information for the individuals in charge of these programs was researched as well, giving WPI

faculty the potential to build a relationship with that office. The information on all the agencies listed in the results section was completed and inserted into the database.

Database

The database serves as a literal representation of a knowledgebase of government agencies. It stores the agency research in a uniform and searchable manner. The information is accessible, and readily available to WPI faculty. The Delphos Database can be expanded in the future easily, allowing for embassies, foundations, development agencies, and corporations to be added.



SWANS Software

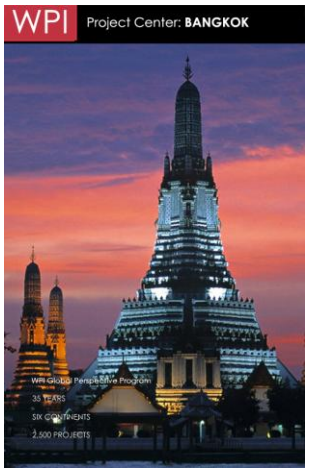
Faculty Survey

Through our faculty survey, the project team can conclude that WPI can learn from the methods of other successful universities. WPI faculty members are engaged in cutting-edge research on campus and some even have future agendas they wish to pursue. The team believes the faculty is dedicated to their research and has been trying very hard to push their proposals to the right people and get the adequate funding for their projects.

Embassy Visits

The project team visited two foreign embassies in Washington, D.C, the South African Embassy and the Royal Thai Embassy, to have discussions with embassy personnel. These discussions included:

- A history of WPI involvement in the respective country
- An overview of the Global Perspectives Program
- Types of projects being completed
- Recent projects being completed



- GE Foundation Proposal (Cape Town)
- Foreign student involvement (Thailand)

Overall these meetings were very successful, and the team found the representatives to be very interested in WPI's programs. The goal of the meeting was for the team to make initial contact with the embassies in the future, WPI staff can continue our work in progressing WPI's relationships with these countries, with the intention of fostering ties that could lead to more projects sponsored by their governments.

A pamphlet for the specific embassies was created by the team, which briefly explained the nature of the IQP and the recent projects completed in the respective country.

Areas of Greatest Potential

Through research of agency agendas, and through the analysis of the faculty survey, the project team has highlighted certain agencies with the potential to collaborate and award program initiatives and proposals from WPI's faculty. While all of the departments listed in the database support WPI's programs in some capacity, the team has identified four departments of greatest potential to WPI:

- Department of Health and Human Services
- Department of Defense
- National Science Foundation
- Department of Energy

Database

The database and software should be deployed by the OSP for use by the WPI Faculty. The database will facilitate:

- Identification of Funding Opportunities
- Alumni contacts within government agencies
- Personnel contacts within government agencies

Continuation of the Project

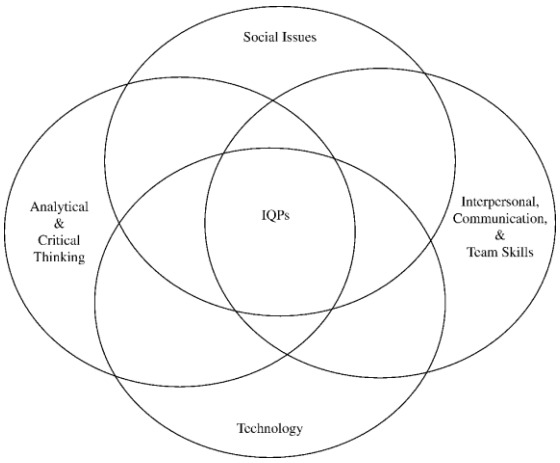
A Following IQP group could continue this work to:

- Update government agency agendas.
- Include private foundations, NGOs, Development agencies and Corporations in the database.

Chapter 1: Introduction

In the academic world, university mission statements center on achieving excellence in all scholarly pursuits. These include not only undergraduate courses and projects, but also faculty research and graduate programs. Institutions cannot strengthen and sustain such a high level of excellence through tuition payments and alumni donations alone. To obtain the necessary funding, they need support from outside resources willing to contribute mutually with the university's agenda. These outside sources of funding are collaborating because they see the potential of the institute, whether it be academic prowess or faculty research expansion. A lack of resources providing the extra capital results in stagnation that can potentially have long lasting effects on the success of the university.

Worcester Polytechnic Institute (WPI) is one such school whose reputation and achievements merit greater recognition and attention than what is currently given. WPI develops socially aware scientists and engineers: students who are conscious of the environment around them while working on research and projects. Students have the option to study abroad and impact societies significantly through a project based learning environment. However, the project based curriculum requires enormous amounts of funding in order for students to gain valuable firsthand experience. As a result, project centers are limited to a certain number of students per year, due to a lack of project leaders and advisers to run them. Additionally, students must pay housing and living expenses to be admitted to the project center, limiting the number of applicants to those with the financial capability. An increase in recognition of these innovative projects would achieve additional funding, leading to greater progression and expansion of project based programs.



WPI's strengths lie not only in its curriculum, but also in its graduate and faculty research. WPI supports interdisciplinary research, with projects classified by subject matter rather than by the department where the research is conducted. This allows for faculty from different fields to collaborate on a project and attack it from multiple perspectives. In recent years, WPI faculty has increased their number of proposals sent to the federal government, (344 proposals in FY2010 vs. 217 in FY2007), showing a desire to pursue more projects. However, the success rate of these proposals being awarded has been declining. Additionally, the dollar value of awards has remained relatively low compared to the requested funding by faculty. In order to achieve a higher success, faculty need to understand where their proposal will have the greatest success within the federal government and also who they can contact, be it government officials or alumni. WPI's future directions, especially agendas of Deans and faculty, will help distinguish which agencies would be best suited to work with WPI.

The purpose of this project is to help WPI attract funding and recognition in Washington, D.C., in support of WPI's educational mission and faculty research. This goal can be achieved with help from government agencies and embassies that could support WPI in terms of projects and research. First this project identified agencies to approach based on WPI's core competencies and previous relationships. A faculty survey was also generated to gain a perspective on top agencies from the individuals creating and submitting the proposals. The information is stored into a newly created database, where agencies and their various hierarchies of sub departments can be sorted and accessed. Software linked to the database was developed to give WPI faculty and staff the ability to easily search through the data and find projects to create proposals. Finally, materials describing specific WPI programs were created and presented to select embassies in order to raise awareness of WPI's project centers within the host nation. The final presentation was given to an alumni audience to promote the database and initiate a greater alumni involvement in WPI affairs. These objectives were used to expand WPI's recognition and understanding of agency agendas, building a foundation for future proposals.

At the completion of the project, the database and software were created, along with a user manual describing how administrators can add information and how faculty and staff can access it. The information collected through the research of each agency was added into the database and, following beta testing, was easy to access and utilize. The faculty survey sent out gave the project team information on the direction WPI faculty is headed, and through the survey it was also discovered that faculty do not often take advantage of WPI alumni relations when submitting proposals. Collateral material featuring WPI's projects were presented to embassies who host project centers for WPI students.

The project team can conclude that the database and software will allow for easier access to agency agendas and will also be a tool for faculty to connect with important alumni and federal staff for additional support. Due to the positive reception of the information presented to select embassies, WPI should begin expanding all of its global project center locations. This project laid the groundwork for future IQP projects designed to improve WPI's standing in the U.S. capital. The database created needs to be constantly updated as agency agendas progress and change. The potential to include non-governmental organizations (NGOs), private foundations, development agencies, and corporations around Washington, D.C. is also possible.

Chapter 2: Background

When it comes to defining an institution of higher learning, two fundamental elements are at the forefront of the discussion: academic curriculum and faculty research. A well-recognized private university must provide its students with intellectual challenges, as well as allowing professors to exercise their skills as researchers outside of the classroom.

A crucial component necessary to reach these high standards of excellence is the proper funding that would go to facilities, lab equipment, project site support, etc. Universities cannot solely rely on tuition income to maintain their academic buildings as well as achieve progress in research and student endeavors. All private universities must exhaust every avenue possible, from government agencies to private corporations, in order to acquire the proper funding for their various departments. WPI can use its strengths as a science and technology focused school to maximize its funding capabilities.

This chapter will provide a detailed description of relations between universities and federal/foreign governments, the major source of academic research funding. This chapter will continue by stating why Washington, D.C. is the optimal location for universities to target for funding. Finally, a detailed explanation of WPI's strengths as a private, science and engineering university will be covered, highlighted by the project requirements all students must complete, as well as current and future research agendas. In addition, WPI's current research funding will be summarized, along with a description of varied disciplines being explored. By the end of the chapter, it will be clear why Washington, D.C. is the optimal location to identify opportunities for faculty research and global projects.

2.1: Funding Resources and Relationships

Research and global project centers require funding to produce a quality product. With more funding, colleges can make a larger impact on the community in which they reside, and where their project centers are located. In order to make this impact, universities need to seek out entities with which to create a symbiotic relationship. An entity must understand that there is a mutual economic benefit among students, faculty, and the entity. This section will detail a university's major source of funding (federal government agencies) and the potential relationships between universities and foreign nations.

2.1.1 Federal Government Funding

The United States federal government is the largest source of funding for academic research and development, representing approximately 60% of total university R&D expenditures in FY 2006 (National Science Foundation, 2007). The most important funding agencies are the six major research departments listed, but all federal departments perform research in some capacity:

- Department of Defense (DOD)
- Department of Energy (DOE)
- Department of Health and Human Services (DHHS)
- National Aeronautics and Space Program (NASA)
- National Science Foundation (NSF)
- US Department of Agriculture (USDA)

University funding mostly comes in the form of grants. An agency will announce available grants and review proposals submitted by university faculty. The grants highlight the agenda of the agency and the programs they are looking to pursue. Table 2.1 shows where each of these departments chose to allocate their funding by field of study. According to this table, the federal government financed $32.6 billion in science and engineering expenditures at universities in FY2009.

Table 2.1: Federally Financed R&D expenditures at universities by science and engineering field by agency (FY2009) (National Science Foundation, July 2011)

(Dollars in thousands)

Science and engineering field	Federal R&D expenditures	DOD	DOE	HHS	NASA	NSF	USDA	Other[a]
All science and engineering	32,587,529	3,366,684	1,236,122	18,054,412	1,106,186	3,947,969	900,630	2,945,113
Science	27,551,479	1,760,271	813,894	17,585,237	818,360	3,067,825	856,293	2,245,637
Computer sciences	1,107,053	347,627	35,040	65,721	21,615	445,631	2,376	119,087
Environmental sciences	1,898,624	176,148	100,942	74,092	251,310	635,611	77,669	547,795
Atmospheric sciences	323,617	25,050	13,941	838	86,497	75,267	4,533	108,029
Earth sciences	648,312	52,468	68,977	12,984	130,709	195,999	54,355	130,610
Oceanography	713,483	80,429	5,941	17,407	19,230	313,512	4,716	250,226
Environmental sciences, nec	213,212	18,201	12,083	42,863	14,874	50,833	14,065	58,930
Life sciences	19,325,733	606,663	176,768	16,074,707	77,058	586,753	726,365	976,972
Agricultural sciences	865,947	18,183	29,745	66,288	7,643	75,000	492,961	159,146
Biological sciences	6,622,027	170,692	107,989	5,323,656	34,669	434,951	183,265	291,127
Medical sciences	11,058,403	391,072	32,367	10,067,984	32,976	48,193	30,627	447,783
Life sciences, nec	779,356	26,716	6,667	616,779	1,770	28,609	19,512	78,916
Mathematical sciences	368,820	58,443	12,731	34,880	4,018	207,904	3,394	21,149
Physical sciences	2,963,748	385,405	437,982	497,659	437,096	892,766	6,911	176,099
Astronomy	389,011	18,003	8,730	1,139	213,647	85,871	0	35,936
Chemistry	1,037,173	130,788	77,197	445,010	12,619	294,173	4,001	55,335
Physics	1,360,811	205,344	335,506	35,815	181,473	456,149	1,663	67,993
Physical sciences, nec	176,753	31,270	16,549	15,695	29,357	56,573	1,247	16,835
Psychology	658,818	37,279	3,229	472,909	10,595	59,986	1,099	66,975
Social sciences	851,954	66,021	27,717	307,411	8,336	139,593	33,831	261,983
Economics	121,360	3,758	4,922	25,091	376	20,281	21,867	43,570
Political sciences	136,583	17,741	2,986	38,650	274	23,435	1,855	51,549
Sociology	201,648	4,286	392	124,609	137	34,285	3,933	32,211
Social sciences, nec	392,363	40,236	19,417	119,061	7,549	61,592	6,176	134,653
Sciences, nec	376,729	82,685	19,485	57,858	8,332	99,581	4,648	75,577
Engineering	5,036,050	1,605,795	421,709	464,740	287,619	874,668	44,077	697,491
Aeronautical/astronautical engineering	431,396	172,297	10,347	4,022	107,369	13,637	419	45,713
Bioengineering/biomedical engineering	385,360	50,667	7,912	252,241	3,663	35,625	10,035	25,202
Chemical engineering	359,793	74,220	71,814	56,788	4,573	93,818	6,154	38,068
Civil engineering	400,897	51,955	27,358	9,318	12,196	87,367	5,842	204,701
Electrical engineering	1,200,497	541,557	36,546	51,887	30,664	262,939	690	81,072
Mechanical engineering	801,095	277,447	120,180	33,496	30,031	116,288	2,128	85,224
Metallurgical/materials engineering	389,258	176,947	48,026	11,252	8,122	98,251	1,112	45,482
Engineering, nec	1,067,754	260,698	99,526	45,736	91,001	166,706	17,697	171,953

HHS, mostly through the National Institute of Health, continues to be the department with the greatest amount of funding allotted for academic research, at roughly 55% of the total. Of HHS funding, 89% is geared towards the life sciences, the largest allotment of money by any one department towards one field of study. Table 2.1 displays the abundance of funding available to universities. Table 2.2 illustrates the federal funding towards non-science or engineering fields in FY 2009.

Table 2.2: Total and Federally Financed Non-Science and Engineering University R&D Expenditures by Field (National Science Foundation, July 2011)

(Dollars in thousands)

	Total				Federally financed			
Field	2006	2007	2008	2009	2006	2007	2008	2009
All non-S&E fields	1,880,873	2,057,844	2,205,849	2,385,876	774,976	807,961	830,703	867,233
Business and management	246,921	275,202	325,595	340,711	52,569	54,472	65,910	67,794
Communication, journalism, and library science	84,681	90,470	89,938	107,548	29,897	30,977	28,643	29,600
Education	816,421	902,196	868,504	921,171	435,244	472,988	449,896	480,083
Humanities	217,075	241,552	246,140	253,224	56,063	60,104	56,122	60,260
Law	68,474	73,790	88,759	106,818	28,302	29,267	28,440	22,829
Social work	89,525	93,259	123,807	138,860	40,442	40,457	59,054	62,489
Visual and performing arts	46,079	46,104	58,990	72,957	3,604	4,016	3,722	4,119
Other non-S&E fields	311,696	335,161	403,988	444,587	128,855	115,680	138,916	140,059

S&E = science and engineering.

While federal funded non-science and engineering university research does obtain a significant amount of money (nearly $2.4 billion in FY2009), this pales in comparison to the $32 billion budgeted towards science and engineering research. More money is necessary, as scientific research is conducted in laboratories, which require additional funding for proper lab equipment, safety measures, the samples/materials used in the experiment, etc. There are also fewer fields listed in Table 2.2 than in Table 2.1. Regardless of the difference in dollar value between the two tables, it is clear that the government has appropriated a substantial amount of money towards university research in all fields.

Government agencies are a critical source of funding for research grants due to their budget towards hundreds of programs and initiatives. Agencies such as the National Science Foundation, Health and Human Services, and the Department of Defense can prove vital support to universities (Branscomb & Auerswald, 2002). These agencies can reach out to universities to support studies they are unable to carry out but are essential to achieving their goals.

2.2 Worcester Polytechnic Institute

This section will highlight the strengths of Worcester Polytechnic Institute. Section 2.2 covers the unique curriculum and grading system utilized at WPI, the project based learning that WPI is famous for, WPI's relationships with the countries where projects are completed, and the research that is conducted at WPI. The strengths described below are what make WPI unique when comparing it to other engineering and science universities. It is due to these strengths that

WPI should receive more funding to become a global model for undergraduate education, as well as a more respected research institution.

2.2.1 Curriculum and Grades

Worcester Polytechnic Institute's curriculum focuses on interdisciplinary activities, and collaboration between students that will prepare them for their respective careers (WPI, 2011w). The classes build upon the "theory and practice" motto, central to WPI by balancing technical and theoretical approaches to learning. WPI expects its students to be proactive with their education by extending themselves to learn on their own.

In order to facilitate collaboration among students WPI does not officially keep track of the students' grade point average. At WPI only the grades of A, B, C, and NR (No Record) are awarded to students (WPI, 2010d). When a student does not pass a course, the class is taken off of their transcript and the class is not recorded. While no credits are received for the class, there is no penalty to the student's transcript. However, the class must be re-taken if it is essential for graduation. This system is used when a student is unsuccessful in a class; he/she is not penalized with a bad grade, but must re-take the class to understand and apply the concepts that are taught.

WPI has a unique academic calendar, with four seven-week terms, and an optional term during the summer (WPI, 2010d). During these terms students take three classes where they are rigorously taught material at twice the rate of semester length college courses. Thus, the workload requires WPI students to focus intensely on their three classes. This allows the students to gain an exceptional understanding of the subjects they are studying at WPI. This schedule benefits WPI's strict course requirements for graduation, which includes the completion of two qualifying projects and a humanities requirement.

2.2.2 Project Based Learning

Four project opportunities are available to WPI students throughout their undergraduate education period (WPI, 2011r):

- Great Problems Seminar (GPS)
- Humanities and Arts Seminar
- Interactive Qualifying Project (IQP)
- Major Qualifying Project (MQP)

The GPS is a semester-long course that gives students their first research and project work at WPI (WPI, 2011). The projects focus on real world problems that are tied to current events, societal problems, and human needs. Notable seminars include Educate the World, Feed the World, Grand Challenges Seminar, Heal the World, and Power the World. These five topics give the students a look at real world problems that they could be working to solve after their undergraduate education.

The Humanities and Arts Seminar is a culmination of a study in humanities and arts for students at WPI (WPI, 2011). After completing five courses chosen to achieve both breadth and

depth, students undertake a concluding project in the subject they choose to focus in. These subjects include, but are not limited to: art, drama, music, languages, literature, history, and philosophy. The concluding project is an inquiry seminar or practicum. The goals of this seminar are to create an original research paper or creative piece of work that displays the student's knowledge of their humanities and arts focus. This project is normally completed in the sophomore year. In some cases, students are given the opportunity to complete their seminar abroad, at WPI's sites in Morocco and Germany.

Students normally complete the IQP in their junior year at WPI. This project relates technology, science, and engineering to the needs of society (WPI, 2011). These projects can either be completed on campus or off campus at one of WPI's many sites around the world. These projects challenge students to use their knowledge in science, engineering, and technology to improve societal problems. A majority of IQP's are completed off campus, and the solutions developed by the students can have immediate and long lasting effects.

Students complete the MQP in their senior year at WPI (WPI, 2011). Unlike the IQP, which stresses science for societal benefits, the MQP is directly involved within the student's major field of study. It is the capstone project at WPI and can be completed on or off campus. The MQP is the culmination of the student's studies in their major at WPI. Students are encouraged to develop their own projects based on their knowledge from the classes they have attended at WPI.

The IQP and MQP can be completed on or off campus and are both required for all WPI students to graduate, whereas the GPS is available for freshmen to get an early introduction to the project based learning of WPI. Approximately 60% of students complete the IQP off campus, a number that is currently increasing (Richard Vaz, personal communication, September 28, 2011).

The success of these projects from a global perspectives standpoint is immeasurable. The IQP and MQP demand full attention and thus represent the academic credit equivalent to three courses. It is a direct application of WPI's motto 'Lehr und Kunst,' meaning 'Theory and Practice.' Furthermore, students at engineering and science schools do not receive the same opportunities to go abroad and complete requirements that liberal arts schools can offer. WPI became the first school to combine the thrill of studying abroad with projects that challenge them academically and fulfill mandatory requirements for graduation. WPI's term schedule allows for these programs to run successfully and efficiently, as an off campus IQP or MQP would take up all three courses in a term. WPI's Global Perspective Program is one of the university's greatest strengths that address real world problems while also offering the benefits of studying off campus.

2.2.3 Global Perspective Program

WPI has projects available to students in eighteen different countries, including the United States (WPI, 2011t). These programs are supported by the Global Perspective Program, and are WPI's link to countries throughout the world. In each of these countries WPI has created project centers where students complete IQP's, MQP's, and Humanities Programs. Due to WPI's

established project centers, relationships have developed within these countries. WPI students are conducting meaningful projects, strengthening the relationships with their hosts. The university hopes to expand upon the relationships that have already been developed. However, IQP and MQP project proposals are not solely dependent on a country's willingness to cooperate but rather on the capabilities WPI has, for example, having faculty members who can direct project centers and ensure their future sustainability (Richard Vaz, personal communication, September 28, 2011). The more faculty members hired, the easier it can be to increase the number of global project centers around the world. Likewise foreign corporations and nations look for students to help with their ongoing research and project work. WPI is constantly looking to create more project centers, and cooperation with foreign governments would allow for successful and sustainable expansion.

2.2.4 WPI Faculty Research Overview and Facilities

In addition to teaching, WPI professors are also occupied by their research programs. WPI supports exciting research projects across a range of subjects, from energy and sustainability to healthcare and educational technology. This has led to a new understanding of subjects and new technologies being developed and designed to solve some of our world's greatest challenges (Manning, 2011). WPI thrives on the collaboration of faculty members from different departments to carry out research projects. Interdisciplinary research is a huge advantage that WPI is able to implement successfully, and this type of research enables the faculty to address global problems more efficiently. The following are major facilities at WPI where research is conducted.

WPI has complemented this drive in faculty research with cutting-edge research facilities and laboratories. The university has over 40 centers and labs between its on campus facilities and the newly built Gateway Park (shown on the right) (WPI, 2011e). On campus, Goddard Hall is a newly renovated building that houses the Chemical Engineering department. This facility contains state of the art chemical laboratories to support a wide range of research topics within these majors along with basic chemical instruments and appliances for introductory courses. Projects include bioreactor engineering, spectroscopy, and medicinal chemistry.

The Washburn Shops is one of the oldest buildings on WPI's campus (WPI, 2011y). Built originally as a student run manufacturing plant, this building is used for Management and Materials Science majors, but is also the home of the Metal Processing Institute (MPI), an institute dedicated to the advancement of metal processing in industries (WPI, 2011h). Their three research centers work on projects such as metal casting, thermal processing, imaging and sensing, and recycling. MPI is one of the best recognized metals processing centers in the nation, supported by over 90 corporations, and receiving funding from private foundations as well as the federal government.

Gateway Park is WPI's newest and fastest expanding research center, located just a few blocks away from campus in the city of Worcester (WPI, 2011c). WPI has completed the construction of new facilities to pursue greater research opportunities as well as partnering with investing companies. Currently, one out of five buildings is fully constructed and operational, the Life Sciences and Bioengineering Center (LSBC), which contains research laboratories for graduate students, faculty, WPI's Bioengineering Institute (BEI), and life science corporations. LSBC supports tremendous research in expanding fields such as biophysics, genetics, nanoscience, and biomaterials (WPI, 2011f). A second building is currently under construction (WPI, 2011c)

2.2.5 Research Projects by Field of Study

Another fundamental strength of WPI is its interdisciplinary research. Rather than being categorized by department, projects are grouped into categories dependent on the field. Professors pool their knowledge and collaborate with each other on several projects. This collection and practical use of knowledge enables researchers to tackle a problem from multiple angles. The following examples are a portion of WPI's research initiative and do not represent the entirety of the ongoing research at the institute.

Energy and Sustainability

A rapidly growing concern on a global level is the need to find new sources of energy that are both cost-effective and sustainable. Currently WPI is taking advantage of its research facilities to tackle this matter. The LSBC is using corporate funding to find ways to economically convert cellulose to ethanol (WPI, 2011f). Using ethanol for fuel would reduce foreign trade for oil and would be a cleaner source of fuel, due to its lack of NO particle emissions (Badger, 2002). The Fuel Cell Center is researching new designs to implement electrochemical devices as power sources for a variety of products from laptops to automobiles (WPI, 2011b). In addition, WPI students have completed IQP projects to support new wind energy technology around the world. This work led to the securing of $575,000 from the state to construct the first wind turbine in Worcester on the campus of a high school (Martinelle, 2006). Overall, WPI is making great strides in an attempt to determine new clean energy fuel sources.

Healthcare

As technology continues to develop it expands further into healthcare, WPI has strengthened its position by combining the two fields together in some cutting-edge projects exploring the challenges of healthcare. Chemical engineers are researching the nature of bacterial adhesion to cells using an atomic force microscope (WPI, 2011d). This research has led to findings on the nature of cranberry juice's success at curing a urinary tract infection, a phenomenon that was not fully understood (Martinelle, 2008). Research is ongoing in Gateway Park on encouraging tissue regeneration following an injury or disease (WPI, 2011d). This knowledge could lead to technology like the development of micro threads laced with stem cells that could transform adult cells into stem cells during surgery. A very promising research project

is the development of medical robots that have the potential to assist doctors in surgery. This is being conducted by the Automation of Interventional Medicine (AIM) Robotics Research Laboratory at WPI and is an immense leap in what has already been an incredibly advancing field in healthcare (Fischer, 2011).

Bioengineering Institute

The Bioengineering Institute (BEI) is known as the translational biomedical research arm of WPI (David Easson, personal communication, September 28, 2011). It was launched in 2002 at the LSBC in Gateway Park and has invested over $100 million into laboratories and facilities with the intent on developing new therapies and devices for the improvement of human health and environment. Some of their projects include remote medical sensors, prosthetic advancement, and surface chemistry for diagnostic devices. BEI also collaborates with faculty from other institutions, including the UMass Medical School, The US Army's Telemedicine and Advanced Technology Research Center (TATRC) and the US Defense Advanced Research Projects Agency (DARPA).

Robotics at WPI

Robotics Engineering is a unique undergraduate field of study with many breakthroughs. WPI was the first college to offer a Robotics Engineering Bachelor's degree. This major requires classes into three other fields: computer science, mechanical engineering, and electrical and computer engineering. Each robotics course has labs that utilize those three areas and a final design project that produces a working product for a specific problem. Students create robots that work semi-autonomously within their first course, and move on to create fully autonomous ones in Unified Robotics (RBE 2001/2002). All robotic students must take a social implications course, which helps to make students aware of the damage certain technologies and designs can inflict. One such research project focused on the implications of robotic space mining where the students identified potential issues in that subject (Ingalls & Chen, 2010).

Once students reach their senior year, most robotic majors design and build a robot for their MQP. These robots either solve real world problems, or help to further the field with innovative products and algorithms. These projects are the highlights of the undergraduate field and feature robots such as the hierarchical swarm robots that utilize a unique programming system to control all the robots in the system (Jones, et al., 2011). These projects can range from prosthetic neural control (Lui & Beach, 2010), to the mechanical design process of an intelligent robotic hand (Whitcomb, Rowell, & Moon, 2006), to robots that mimic snake movements through sand (Humphrey & Benson, 2009). This program is extremely innovative and builds products that can be used in the private and government sectors.

Other Selected Research Areas

WPI is investigating possible improvements in the effectiveness of elementary education in mathematics and science by developing tutoring systems that can teach and assess the progress of young children in these subjects (WPI, 2011a). This system would also help teachers adjust

their lessons based on the results, and communicate to parents more effectively on the progress of their children. One of the most recognized departments at WPI is the Fire Protection Engineering Department, which has also expanded into a five year program. Research involves fire conduct and safety from ignition prevention to building safety. This also expands into protection for firefighters who get injured or lost inside a burning building, in collaboration with WPI's Precision Personnel Location team. Another research laboratory is WPI's Surface Metrology Laboratory, which has recently developed methods for exploring the surfaces of objects in an attempt to understand their history and material properties (WPI, 2011g). This work is closely related to a chemistry and bioengineering project at the LSBC with regards to nanotechnology capable of sensing applications based on their chemical and biological properties, along with studying bacteria at a molecular level (WPI, 2011f).

2.3 WPI's Research Funding

WPI's research funding comes primarily through the proposals submitted by WPI faculty to government agencies. The research is conducted based on the allotted funds the faculty receives from the entity receiving the proposal. The main department within WPI overseeing research proposals is the Office of Sponsored Programs (OSP). WPI also allocates money towards maintaining facilities and equipment. The Office of Development and Alumni Relations also plays a role in upgrading research facilities.

2.3.1 The Office of Sponsored Programs: Proposals and Funding

The Office of Sponsored Programs at WPI is in charge of facilitating external funding for scholarly research and training for the staff and faculty at WPI (WPI, 2011q). The office reviews and approves proposals for the funds by the faculty and staff. The OSP works with many different private, public, and federal agencies that fund programs at WPI. Table 2.3 displays the federal agencies that WPI faculty sent proposals to in FY2009, and FY2010.

Table 2.3 Comparative Summary of Proposal Submissions by Sponsor FY2010 and FY2009 (Office of Sponsored Programs, Winter 2010-2011 (Office of Sponsored Programs, 2010-11)

Worcester Polytechnic Institute
Comparative Summary of Proposal Submissions by Sponsor
FY2010 and FY2009

Sponsor	FY2010 No.	FY2010 %	FY2010 Amount	FY2010 %	FY2009 No.	FY2009 %	FY2009 Amount	FY2009 %
Federal								
Air Force	5	1.5%	$717,415	0.4%	8	2.6%	$959,026	0.8%
Army	14	4.1%	25,868,756	14.0%	19	6.1%	11,989,147	9.5%
DARPA	10	2.9%	2,042,932	1.1%	6	1.9%	1,358,784	1.1%
Department of Agriculture	0	0.0%	0	0.0%	1	0.3%	399,880	0.3%
Department of Education	12	3.5%	29,700,491	16.0%	10	3.2%	9,003,495	7.1%
Department of Energy	25	7.3%	19,496,129	10.5%	4	1.3%	21,238,578	16.8%
Health and Human Services	30	8.7%	23,949,632	12.9%	51	16.3%	34,683,803	27.4%
Department of Homeland Security[1]	4	1.2%	1,711,648	0.9%	2	0.6%	792,689	0.6%
Department of Justice	2	0.6%	852,526	0.5%	1	0.3%	287,568	0.2%
Department of Transportation	5	1.5%	349,057	0.2%	3	1.0%	728,388	0.6%
Environmental Protection Agency	0	0.0%	0	0.0%	2	0.6%	503,671	0.4%
NASA	7	2.0%	1,131,559	0.6%	4	1.3%	605,699	0.5%
National Science Foundation	141	41.0%	68,829,847	37.1%	118	37.8%	33,395,197	26.4%
Navy	8	2.3%	856,423	0.5%	4	1.3%	419,508	0.3%
NEH	2	0.6%	700,899	0.4%	0	0.0%	0	0.0%
NIST	9	2.6%	4,036,810	2.2%	5	1.6%	853,737	0.7%
Other Federal	10	2.9%	704,485	0.4%	7	2.2%	2,677,487	2.1%
Subtotal - Federal	284	82.6%	$180,948,609	97.6%	245	78.5%	$119,896,657	94.7%
Commonwealth of Massachusetts	8	2.3%	372,527	0.2%	5	1.6%	935,919	0.7%
Corporations	31	9.0%	1,937,089	1.0%	27	8.7%	1,429,727	1.1%
Foundations	4	1.2%	236,502	0.1%	14	4.5%	1,571,789	1.2%
Foreign Organizations	5	1.5%	751,609	0.4%	4	1.3%	998,867	0.8%
Private Organizations	11	3.2%	867,442	0.5%	14	4.5%	1,324,706	1.0%
Public Organizations	1	0.3%	236,923	0.1%	3	1.0%	426,912	0.3%
Totals	344	100.0%	$185,350,701	100.0%	312	100.0%	$126,584,577	100.0%

[1]Includes Federal Emergency Management Agency (FEMA)

Overall, WPI faculty submitted proposals requesting a total $185 million in FY2010, a 46% increase from the previous year ($126.5 million in FY2009). 82.6% of this funding was requested from the federal government, with the National Science Foundation leading the way with just under $69 million from 141 proposals. Fourteen federal departments are listed in this table (Army, Air Force, and DARPA are divisions of the Department of Defense and NIST is under the Department of Commerce), and five of the six major agencies for funding had proposals sent to them in 2010.

The fundamental function of the Office of Sponsored Programs is to assist WPI faculty in reviewing research proposals to ensure it is within the proper guidelines. They also assist in the preparation and submittal of research proposals. The OSP accomplishes this by first identifying

potential sources of funding for faculty that approach the office (WPI, 2011q). When a potential source is found, the faculty member will create a proposal for the source. The OSP will review and submit the proposal to the source of funding. If the proposal is accepted then the OSP receives the funds, which are distributed to the faculty member. Every year there is a large number of proposals submitted by the OSP for funding at WPI. A breakdown of the number of proposals submitted and accepted per year from FY1996 to FY2010 is shown in Figure 2.1. Figure 2.2 illustrated the total dollar value of the proposals submitted and awarded for the same period of time.

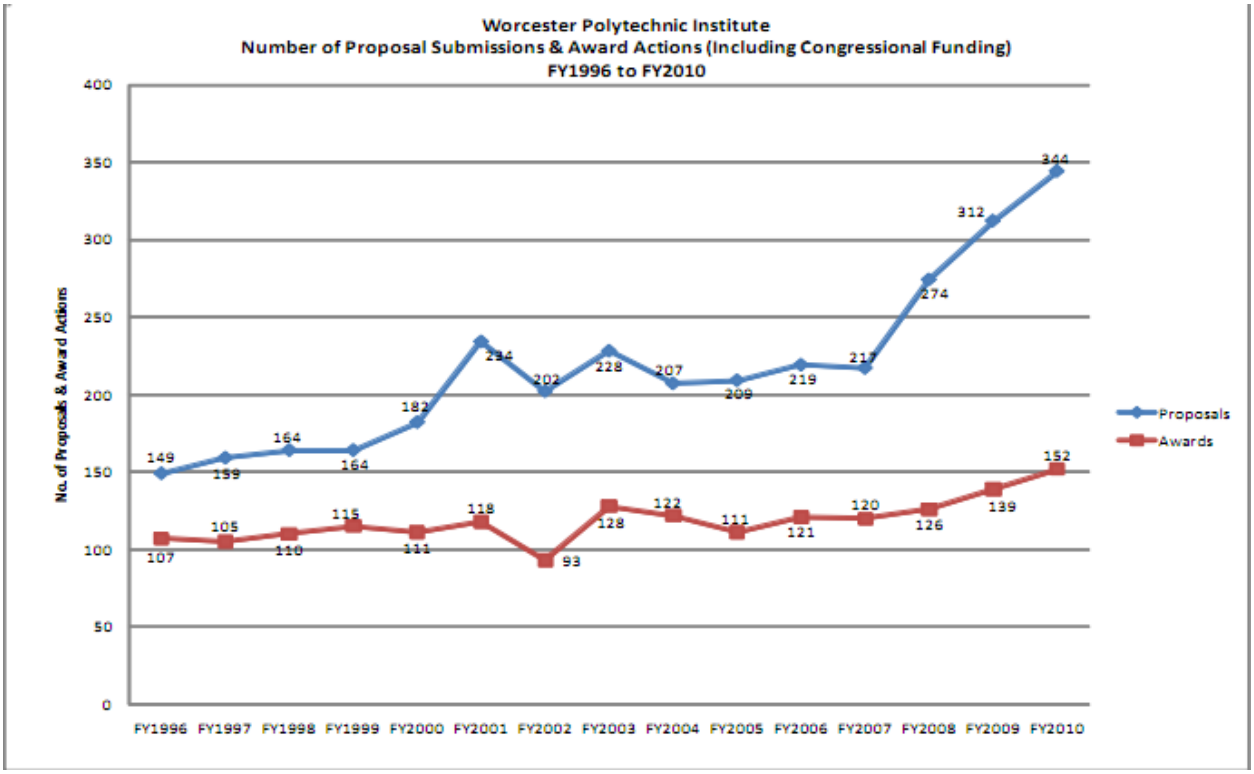


Figure 2.1 Number of Proposal Submissions & Award Actions (Including Congressional Funding) (Office of Sponsored Programs, Winter 2010-2011) (Office of Sponsored Programs, 2010-11)

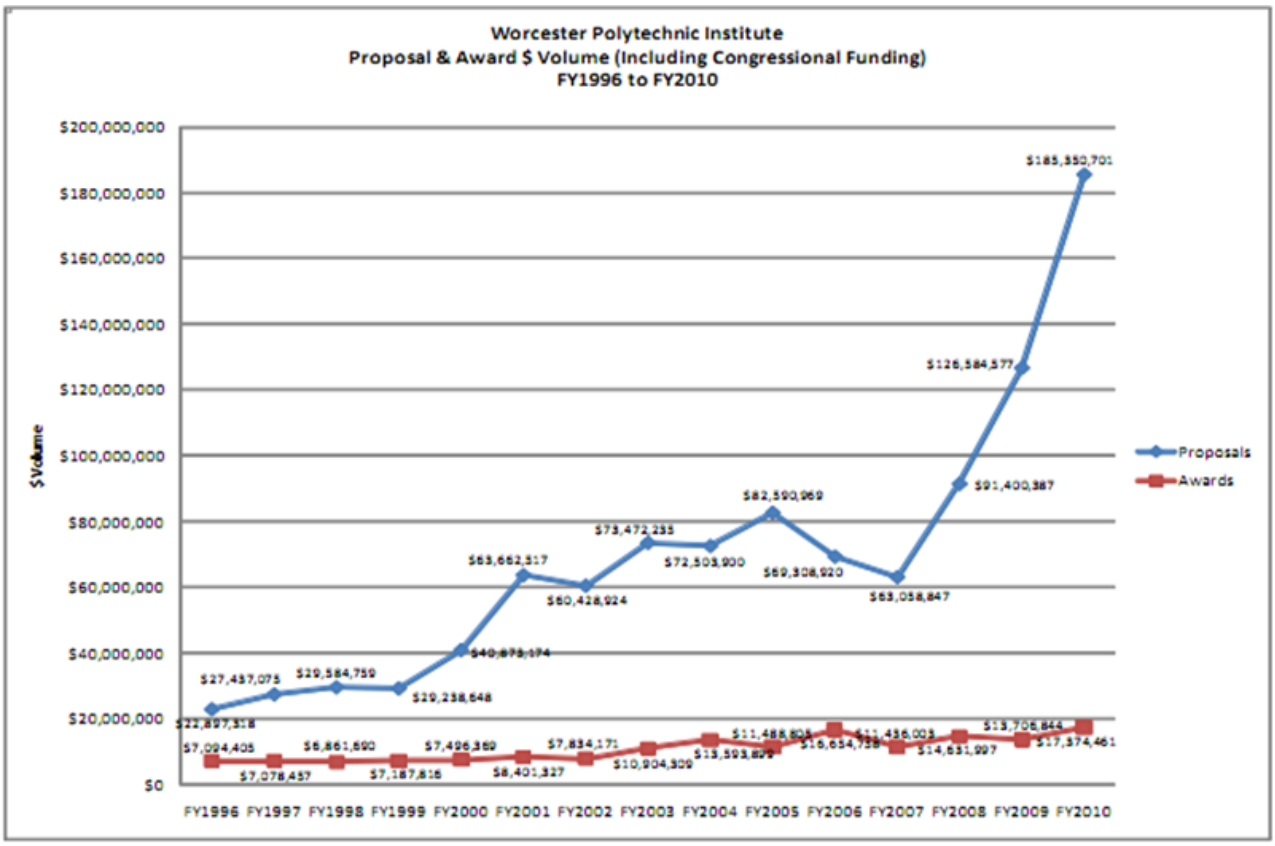


Figure 2.2: Total Dollar Value of Requested Funding and Awarded Funding (Office of Sponsored Programs, 2010-11)

While Figure 2.1 illustrates a widening gap between WPI's proposal number and awarded proposals, Figure 2.2 offers a much clearer view of a problem WPI is having in acquiring funding. The last few years (FY2007-2010) recorded a 58.5% increase in the number of proposals WPI faculty have submitted. The increase in proposals awarded with funding has not shared the same spike, dropping the proposal award rate 55% to 44%. This is a relatively significant decrease, but not nearly as significant as the data in Figure 2.2. In the same span of years, requested funding nearly tripled, (194% increase), yet the total funding awarded to WPI faculty increased by 52%. In FY2010, WPI received 9.4% of its requested funding. Figures 2.1 and 2.2 shows that WPI is rapidly increasing its agenda with new initiatives and research topics, yet it has not been able to match this with the adequate funding.

A full list of funding agencies the OSP works with, along with more figures and tables for the fiscal year of 2010 are included in Appendix C.

2.3.2 The Office of Development and Alumni Relations

WPI's Office of Development and Alumni Relations is made up of eight divisions entrusted to build and sustain relationships with WPI's alumni, parents, and friends, working to carry out the philanthropic needs of the university. Currently, this office is implementing a massive campaign to bring in a large amount of funds to WPI. The funds brought in are all in the

form of donations from three distinct sources: Alumni, Organizations, and Other Individuals. Figure 2.3 shows the Donor Commitment of these different groups to date over the span of the campaign, which is in its third of four years. The goal is to raise $200 million.

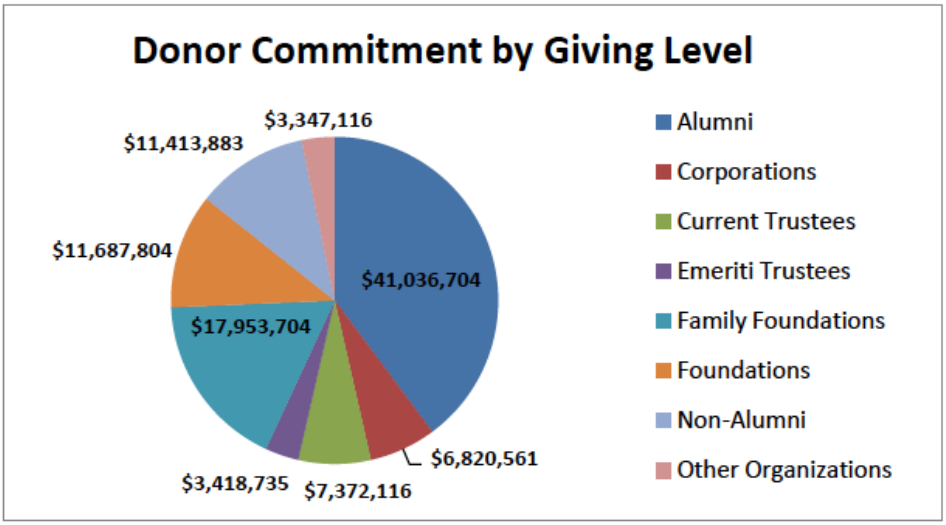


Figure 2.3 Level of Donor Commitment to WPI (WPI, Office of Development and Alumni Relations, 2011)

Figure 2.3 shows how positively these groups responded to this fundraising campaign, with alumni donations eclipsing $41 million at the current stage of the campaign. This is important in understanding that the alumni are more than willing to support their alma mater. Thus, if approached, they would potentially also be willing to help in ways other than donations. In terms of faculty research, the Office of Development and Alumni Relations proportions out money from their campaigning to go towards individual departments to improve lab equipment, and also for the upkeep of the research facilities for WPI faculty. Table 2.4 displays an allotment of the funds distributed towards the various departments at WPI.

Table 2.4 Breakdown of the Office of Development and Alumni Relations Budget (WPI, Office of Development and Alumni Relations, 2011)

Department	Cash	Deferred Gifts	Gifts in Kind	Pledge Balance	Revocable Death Bequests	Total Commitment
Current Use Unrestricted	8,732,261		-	-	-	8,732,261
Endowments	921,666		-	50,000	1,000,000	1,971,666
Diversity & Women's Programs	232,302		-	2,779	-	235,081
Information Technology	359,797		13,104	-	-	372,901
K-12 Outreach	1,660,911		-	104	-	1,661,015
Library	33,253		102,541	3,231	-	139,025
Minority Affairs	176,270		-	100,000	-	276,270
Other Academic Support	888,075		-	1,087,000	-	1,975,075
Physical Education & Athletics	268,803		1,901	550	-	271,254
Biology/ Biotechnology	66,885		113,450	-	-	180,335
Biomedical Engineering	8,490		-	510	-	9,000
Chemical Engineering	58,666		8,500	-	-	67,166
Chemistry and Biochemistry	3,239,625		-	-	-	3,239,625
Civil & Environmental Engr	2,211,170		28,072	25,000	-	2,264,242
Computer Science	149,353		47,590	-	-	196,942
Corporate Education	-		339,910	-	-	339,910
Electrical & Computer Engr	554,967		375,000	-	-	929,967
Fire Protection Engineering	333,608		101,340	499,200	3,000,000	3,934,148
Humanities and Arts	233,647		-	63,650	-	297,297
Management	1,363,493		290	592,175	-	1,955,958
Manufacturing Systems	100		-	-	-	100
Mathematical Sciences	545,953		-	-	-	545,953
Mechanical Engineering	792,413		183,456	-	-	975,869
Physics	109,495		53,500	-	-	162,995
Social Science/ Policy Studies	425		-	-	-	425
Social Science/Policy Studies	150		-	-	-	150
	441,050	-	1,500	421,500	-	864,050
Endowments	-	2,968,042	-	-	-	2,968,042
	32,695,552	9,576,940	217,761	9,398,495	16,554,357	68,443,104
	$ 56,078,378	$ 12,544,982	$ 1,587,914	$ 12,244,194	$ 20,554,357	$ 103,009,825

Table 2.4 shows the benefits of alumni donations, as different departments, based on the research agendas and facility needs, have received various degrees of funding as appropriated by the Office of Alumni Relations. This money is used to update facilities and equipment, as well as aiding faculty research funding. The endowment budgeting is partially used by the IGSD in supporting and maintaining project centers around the world.

2.4 Washington, D.C.

Washington, D.C was founded in 1790 as the capital city for the United States (Destination DC, 2011). The location was chosen specifically as a compromise between the northern and southern states following the Revolutionary War. It is not considered a part of Maryland, although it sits on original Maryland territory. Over the past 200 years, the capital of the US has attracted government workers, lobbyists, petitioners, and Congressmen representing every state. The capital also boasts a great ethnic diversity that is not limited to the foreign embassies.

Washington, D.C, as the capital, houses all three branches of the US government, each with overarching mission statements and agendas. Under the Executive Branch are the departments delegated to make up the division of labor and responsibilities for all societal needs. Major departments under the Executive Branch include the Department of Defense, Department of Energy, and Department of Health and Human Services. Each of these agencies is appropriated money from the Treasury to complete individual agendas, and these agencies budget money towards research initiatives and programs. Some research is done 'in-house' but the agencies also sponsor extramural research through grants. Figure 2.3 shows an example of the Department of Defense's budget in FY2010. While research and development is not the top priority for this agency (Research Development Test & Evaluation), it is still budgeted a substantial amount of money.

Appropriation Title	FY 2009	FY 2010	Δ FY 2009 – FY 2010
Military Personnel	124.9	136.0	+8.9%
Operation & Maintenance	179.1	185.7	+3.7%
Procurement	101.7	107.4	+5.6%
RDT&E	79.5	78.6	-1.1%
Military Construction	21.9	21.0	-4.1%
Family Housing	3.2	2.0	-38.0%
Other	3.2	3.1	-1.1%
Total	**513.3**	**533.8**	**+4.0%**

Figure 2.4: Department of Defense Budget Appropriation (Dollars in Billions)

Additionally, many foreign embassies are stationed in Washington, D.C, the majority of which are located on 'Embassy Row.' Given that the embassy is a diplomatic representative of its foreign nation, it is much easier to speak directly with the individuals from the embassies than to travel directly to the nation. Washington, D.C. has made a name for itself as the political hub of the world because of the vast government networks the city contains within its boundaries (Destination DC, 2011).

2.4.1 Foreign Relationships

A university can also look overseas to foreign countries to secure funding or fulfill parts of the school's agenda. Many universities have facilities or study abroad programs outside of the United States. The goal of these centers varies between schools; some send students to work for private companies that sponsor projects; others simply send students to study abroad at another institution. Universities and governments could benefit from a relationship focusing on individual national issues. Environmental problems are becoming common in many countries, and universities can use their wealth of knowledge to develop strategies to help heal the land. The students could work on projects that directly benefit communities. For example, at WPI, students traveling to Namibia help develop water pumps that are cheap and accessible to nearby villages (WPI, 2011n).

Embassies can be used as the link between their nation's government and a university. WPI could benefit from approaching embassies, especially of developing nations to form a symbiotic relationship between them. Countries where WPI students carry out IQP and MQP projects have had very successful relationships with their hosts all around the world, such as Thailand, Denmark, Namibia, and France, to name a few. Currently, WPI has 29 off campus project centers, and are looking to increase that number in the next few years (Richard Vaz, personal communication, September 28, 2011).

2.5 Funding Opportunities for WPI

There are currently hundreds of different agencies in the Washington, D.C. area. Theoretically, WPI could be tapping nearly all of them for funding to expand and develop its unique curriculum and strengths. Currently WPI is only receiving funds from a few of those agencies in the Washington, D.C. area and thus, must solidify and expand its current supporters.

Out of all of these agencies, there are many that have agendas and goals that align with WPI's. However, there is a limited inventory of the many agency agendas, for WPI's use. Our project will identify the agencies in the Washington, D.C. area, catalogue what their goals and agendas are, and discern if those goals and agendas align with WPI's. In the future this will allow WPI to align themselves with these agencies, and gain funds to expand and develop as an educational model.

Chapter 3: Goals and Deliverables

The goal of this project is to identify agenda alignments between WPI and government agencies and create a knowledgebase detailing opportunities in the Washington, D.C. area. This knowledgebase must be accessible to the individuals who would benefit the greatest from it, namely, WPI government relations staff, the Office of Sponsored Programs, and faculty members.

The knowledgebase is obviously the central focus of this project, as it is the tangible result that will be implemented and used at WPI in the future. It contains the following:

a. Compilation of departments, sub-departments, and offices within federal agencies
b. Contact information of personnel within offices of agencies
c. Grants obtained by WPI faculty members; faculty will have the option to enter this data themselves

This knowledgebase is in the form of a database linked to user friendly software which the project team has developed. This database contains information on agencies in the federal government, specifically their research focus and agendas. They are further divided into their corresponding departments and sub-departments which allows for an intimate knowledge of opportunities available for the specified program, as well as the respective government contacts. The knowledgebase can be expanded in the future to include alumni contacts around Washington, D.C. with careers in specific federal agencies, as well as contacts within foreign embassies based in Washington, D.C.

Through the software, users (WPI faculty and staff) are able to easily access this information in search of opportunities for individual research, project center growth, and alumni connections. Two user manuals are provided in this report: one describes how administrators can update and maintain the software for its long term usability; the other assists inexperienced software users in navigating the interface.

This report details the following aspects of our methodology:

a. Summary of university case studies.
b. Analysis of faculty survey regarding WPI's success in obtaining government opportunities.
c. Analysis of agency agendas and funding opportunities.
d. User manual for database software.
e. Recommendations for relationships with greatest potential.

A case study of other universities' ability to attract federal funding for their research agenda is included. The faculty survey results are analyzed regarding WPI's success at obtaining federal funding from the faculty's perspective as well as the direction of their individual research aims. A further analysis of agency agendas is included based on the research compiled for the database detailing the programs each are invested in, both current and future. These topics lead into the project team's recommendations for areas within the government that align with WPI's

agenda. These areas are aligned with certain aspects of WPI's agenda. In addition, the project team has created prototypical marketing materials focused on global project centers which can be used along with WPI's pre-existing marketing materials, in presentations to embassies. This material aims to raise awareness of the success WPI students have achieved at these project centers, especially in emerging markets.

Chapter 4: Methodology

WPI would benefit from greater recognition in the Washington, D.C. area, where it can build and foster opportunities to expand its academic and research agenda. A lack of an organizational knowledgebase detailing opportunities within federal governments prevents WPI from reaching its maximum potential, specifically in fulfilling their needs of well-funded student projects and faculty research. This chapter will detail the project team's methods at approaching the goal; first, by researching agency agendas and opportunities; second, inserting the researched information into a created database with a software user interface; and third, aligning WPI's strengths with agency agendas and formulating recommendations for WPI staff and faculty on the agencies with the greatest potential for funding.

4.1 Determine potential opportunities

In order to identify where WPI can find significant amounts of funding, the project team has conducted research on government agencies in Washington, D.C., most likely to align with WPI's educational and research agenda. Within these departments are hundreds of programs looking for partners among many U.S. research facilities, including universities.

4.1.1 Analyzing Federal Expenditures and Reports

Despite the increase WPI has had securing funding from the government, other universities have been more successful in raising awareness of their programs, evidenced by their accomplishments in obtaining greater funding. The project team has researched schools based on three criteria. The first case study was on Rensselaer Polytechnic Institute (RPI), another technical school similar to WPI. The second was on the University of Maryland at College Park, a state school with a close proximity to the capital city, and thus can advertise their programs more effectively and quickly than WPI. The third case study was on a university that does not fit either of the previous two demographics (i.e. not a technical school and farther away from Washington, D.C.). The university selected was Northwestern University. The federal expenditures reports of each college have been analyzed to determine where the school is receiving funding from within the government and the strategies each university employs.

4.1.2 Contact Local Alumni

In addition to using Delphos International's extensive network and marketing strategies, we have reached out to notable WPI alumni working around the Washington, D.C. area who have enjoyed success in their respected careers building contacts within the federal government. This achieves two goals: it raises awareness of this project to successful alumni who may be willing to help their alma mater and it allows for a more extensive list of potentially beneficial government agencies for WPI faculty members to utilize. Mr. Delphos has offered to use his

contact list of WPI alumni to begin reaching out to them. They were invited to the final presentation of the project in an attempt to promote the database throughout the alumni.

4.2 Determine Agencies' Agendas

This section details the means of determining WPI's alignment with agencies in DC. This can only be accomplished by determining the agencies' organizational agendas and matching them to WPI's mission and strengths. Each agency has been thoroughly researched, reviewed and documented.

4.2.1 Agency Research

Government agencies were selected for research based on the university case studies and their history of funding WPI projects. Each government agency is thoroughly studied, from their goals and mission statement, to their funding programs, to the contact information of program managers. Government agencies are comprised of many sub departments, offices, and branches each with their own specific agenda. The project team delved into these sub entities to give WPI a deeper understanding of where certain projects are run and the personnel responsible for them. This information is added to the created database, which is explained in Section 4.3.

4.2.2 Assessing WPI's research agenda

Based on the knowledge gathered about agency agendas, the project team determined the best matches for WPI. A survey was created and sent out to the WPI faculty to gauge their research interests, current projects, and future endeavors. The faculty was asked, among other questions about their current and future research agenda and the means they use to achieve their funding. This gave the team a perspective of WPI's success from the individuals directly writing the proposals and conducting the research. The full survey, along with faculty responses, is detailed in Appendix E.

4.3 Database and Software Creation

A major part of the proposal submittal process is the knowledge professors have on specific departments within agencies. The vast, overwhelming content contained in each department and subsequent sub-department makes it difficult to navigate between agencies and search for specific programs. If there was a way for faculty to complete this efficiently and to find previously procured grants within their field, their success at achieving awards may increase. This section details the architecture of the database, as the project team's method for storing this information, and software linked to the database which provides for user friendly interaction.

4.3.1 Database Creation

The benefits of a database allows for multiple ways to access and report information. This database also permits the linking of data (relationships) and therefore allows for easier and understandable access to certain information. For example, when someone searches for an office, they can easily find which department and sub-department that office is under. They can additionally find those people that work within that specific office.

4.3.2 Software Design and Creation

With this database fully populated by research, professors can use it to determine where to send proposals. However, many professors are already busy with their research and teaching, and thus may not be willing to invest time into utilizing the database. Therefore some type of user friendly interface to add and access data was necessary for this knowledgebase to be most useful.

The project team designed and created a user friendly interface that will allow for further editing and additions to the database. The software developed has fields for all information in the database and can be used to sort through agencies in user specified manner. A design for adding an agency to the database is illustrated in Figure 4.1.

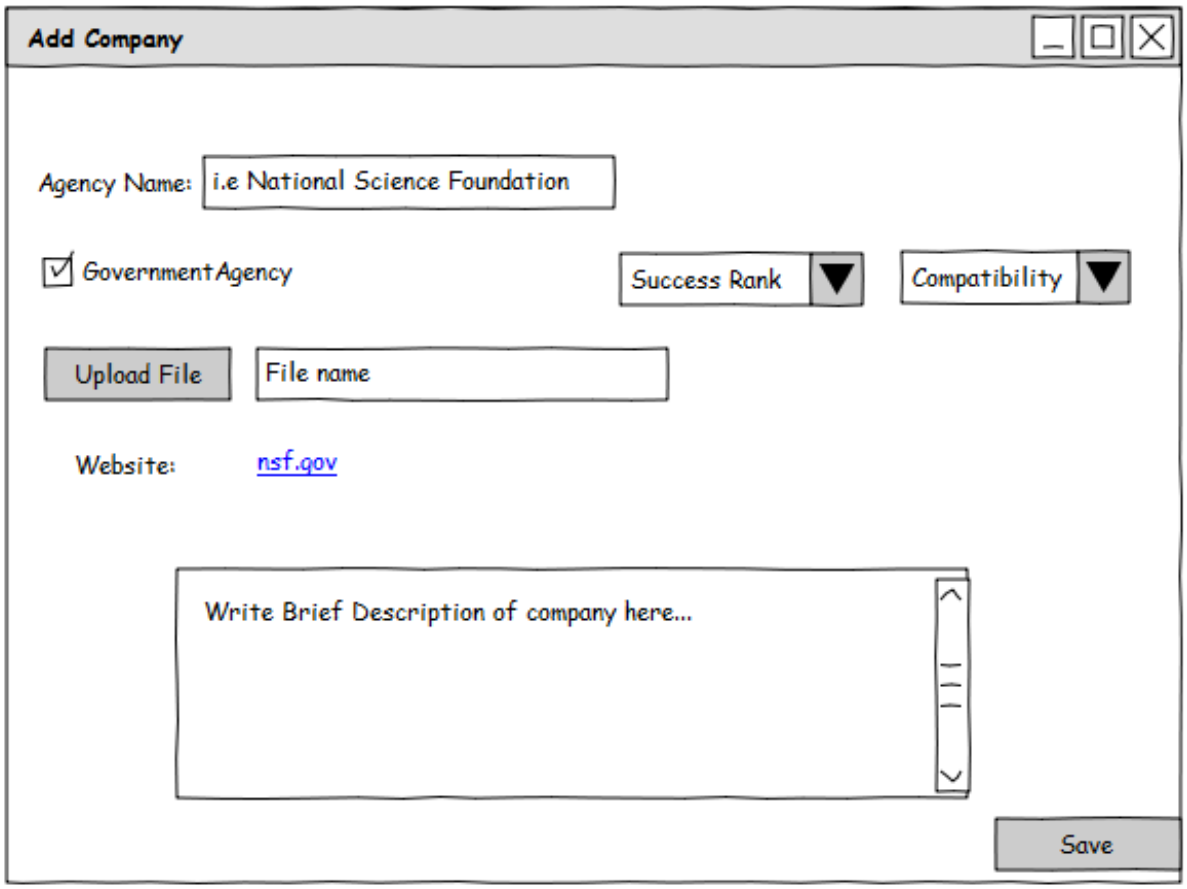


Figure 4.1: Prototype Menu for Software

Creating this software will allow anyone who utilizes the database to organize data easily and provide a means to keep track of our research progress. Figure 4.1 shows a preliminary design for such software that would allow each user to input data into all the necessary fields. In conjunction with data entry, we have a way for users to bring up sorted and/or filtered data. Figure 4.2 illustrates how a user can navigate through the data and find specific information on agencies.

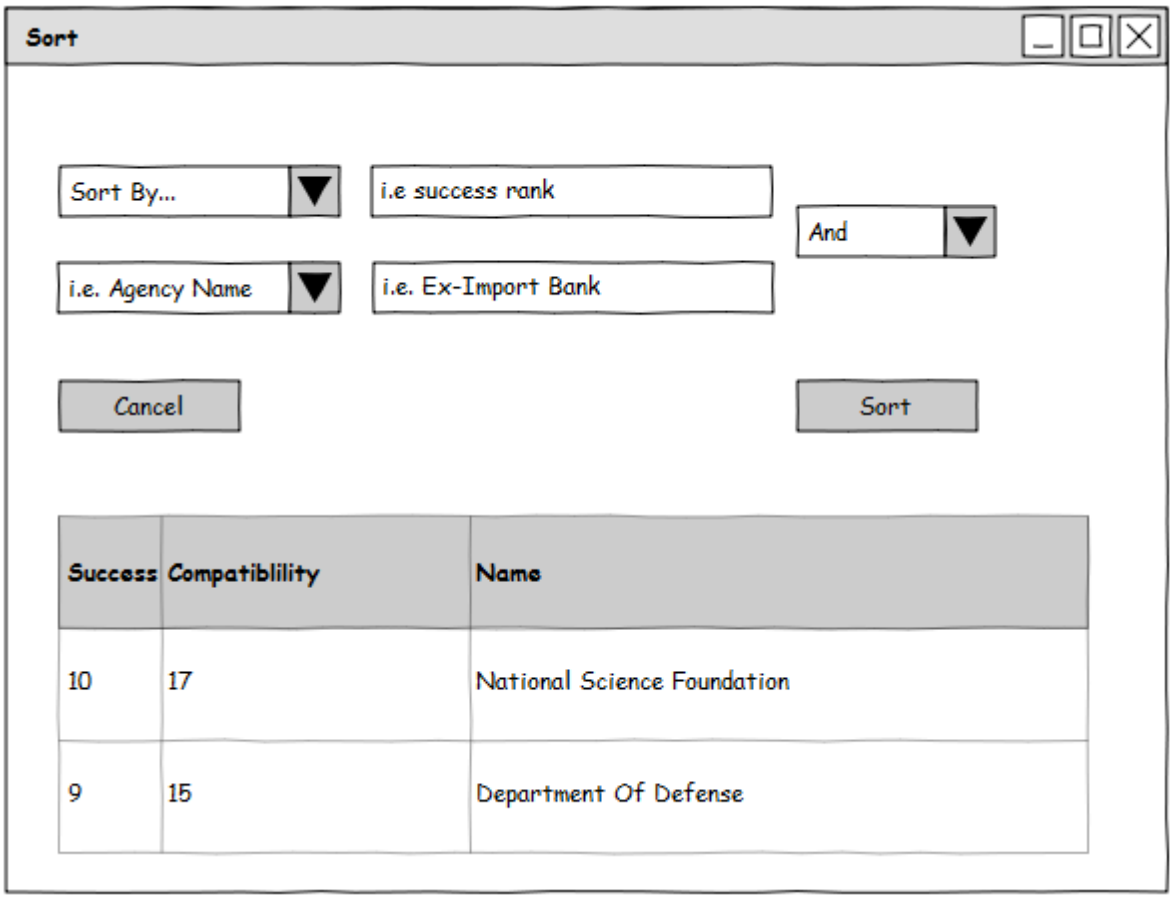


Figure 4.2: Prototype for sorting through the database

4.4 Creating Collateral Material

In addition to targeting federal agencies, the project team reached out to select embassies stationed in Washington, D.C. that host a project center to discuss the role of WPI's Global Perspectives Program within their country. The project team created collateral material describing the nature and success of the project center both from the student and country perspective. The pamphlets, along with pre-existing WPI materials, were presented to the respective embassies to raise awareness of the efforts WPI has made to aid the country. Through this newfound awareness, WPI can begin strengthening and expanding the center with the help of the host nation's government. One section of this material contains a brief overview of what

type of project the students are completing (IQP, MQP, Humanities, etc.) along with project center sites and certain highlighted projects. The second section will feature past and current projects WPI completed specific to that nation. The embassies selected were South Africa, and Thailand.

4.5 Recommendations

The last part of our methodology is to create recommendations to WPI's faculty and staff, on the areas of greatest potential alignment between programs at WPI and certain agencies researched. Our analysis section details data on the agencies that were researched, along with the data collected from our case study on other universities. The recommendations contain information on specific agencies, and why they are the best matches to WPI, based on what types of programs the agencies support, their missions, their research interests, how much funding WPI has received in the past from them, and how much the case study colleges have received from the agencies in the past. The recommendations explain why the agencies selected could be major supporters of WPI's projects, research, and curriculum. To give this project a lasting impact, this section also includes the project team's recommendations for the continuation of this project.

Chapter 5: Results and Analysis

This section covers the results and analysis from the methods outlined in the previous chapter. An analysis of the annual reports of the universities selected and the results of the survey sent to WPI faculty are included. The main body of this section covers the creation and setup of the database and software and its benefits to WPI faculty as a tool for easy access to government programs and contacts. The results section also describes the features of the software to allow for greater understanding and utilization by faculty.

5.1 University Case Studies

Three universities were selected to act as case studies. They were selected in order to satisfy three demographics: a technology based school like WPI, a school close to Washington, D.C., and a school which does not fit either of the first two criteria. The proposal reports, compiled every fiscal year, were obtained and analyzed to determine how successful each university has been at receiving funding for their proposals. The three universities chosen were Rensselaer Polytechnic Institute, University of Maryland at College Park, and Northwestern University.

5.1.1 Rensselaer Polytechnic Institute

Rensselaer Polytechnic Institute is a private research university and one of the oldest technological universities in the world, founded in 1824. Rensselaer has become more aggressive in their faculty research development. According to the fiscal year 2010 financial report (the most recently published report), the school has obtained $142,698,170 in external research support (Rensselaer Polytechnic Institute, 2010). The funding has been shown to come either directly from federal agencies or indirectly, through corporations. RPI obtains the majority of its funding from the big research departments within the government, namely, the Departments of Defense, Energy, Commerce, and Health and Human Services. RPI has also received indirect government funds from collaborating universities, with the University of Wisconsin and Notre Dame being notable partners. Within each department in the government is a listing of each program RPI received awards for and in some cases, from which division of the department it received the award.

5.1.2 University of Maryland at College Park (UMCP)

The University System of Maryland is a system of 12 charter schools and universities for higher education, the flagship campus being the University of Maryland at College Park. The rationale behind the selection of UMCP was to select a large research university near Washington, D.C. that, due to its proximity, can potentially tap into federal departments with greater success than others. This claim, based on UMCP's awards, may be correct as evidenced by Table 5.1. This table is a brief illustration of the federal and non-federal funding UMCP

received in fiscal year 2010 through the Office of Research Administration and Advancement (ORAA).

Table 5.1: Funding Awards for UMCP (federal and non-federal) (Division of Research, 2010)

CATEGORY	Agency or Sub-category	Award Amount	Percentage of Federal	Percentage of Total
FEDERAL	Department of Defense (DoD)	$94,946,409	24.66%	19.71%
	National Science Foundation (NSF)	$72,886,657	18.93%	15.13%
	Department of Commerce	$55,849,024	14.51%	11.59%
	Dept of Health & Human Srvc (DHHS)	$49,165,474	12.77%	10.21%
	Nat'l Aeronautics & Space Admin. (NASA)	$41,193,414	10.70%	8.55%
	All Other Federal	$20,549,556	5.34%	4.27%
	Department of Agriculture (USDA)	$17,613,598	4.58%	3.66%
	Department of Energy (DoE)	$12,994,622	3.38%	2.70%
	Department of Homeland Security (DHS)	$11,050,602	2.87%	2.29%
	Department of Education	$8,725,015	2.27%	1.81%
	FEDERAL TOTAL	$384,974,370	100.00%	79.92%
CATEGORY	Agency or Sub-category	Award Amount	Percentage of Non-Federal	Percentage of Total
NON-FEDERAL	State of Maryland	$33,372,125	34.51%	6.93%
	Universities	$19,905,208	20.58%	4.13%
	Corporations	$15,388,655	15.91%	3.19%
	All Other Non-Profit	$10,580,661	10.94%	2.20%
	Other Govt. Entities	$10,211,799	10.56%	2.12%
	Foundations	$4,844,507	5.01%	1.01%
	Foreign Organizations	$2,411,959	2.49%	0.50%
	NON-FEDERAL TOTAL	$96,714,914	100.00%	20.08%
COMBINED TOTAL: Federal/Non-Federal*		$481,689,284		

UMCP received a combined total of $481,689,284 from various funding sources, with just less than 80% coming from federal departments (Division of Research, 2010). Including outside sponsored research, UMCP obtained just under $545 million, a quantity 30 times larger than what WPI received in the same fiscal year. On a per faculty member basis UMCP brings in approximately $150,000, and WPI brings in $42,000. The largest contributor was the Department of Defense (24.66% of federal funding) most likely due to the vastness of the department and the research requested from the divisions within it, like the Army, Navy, DARPA, etc. Figure 5.1 shows a pie chart of the distribution of federal funding by department.

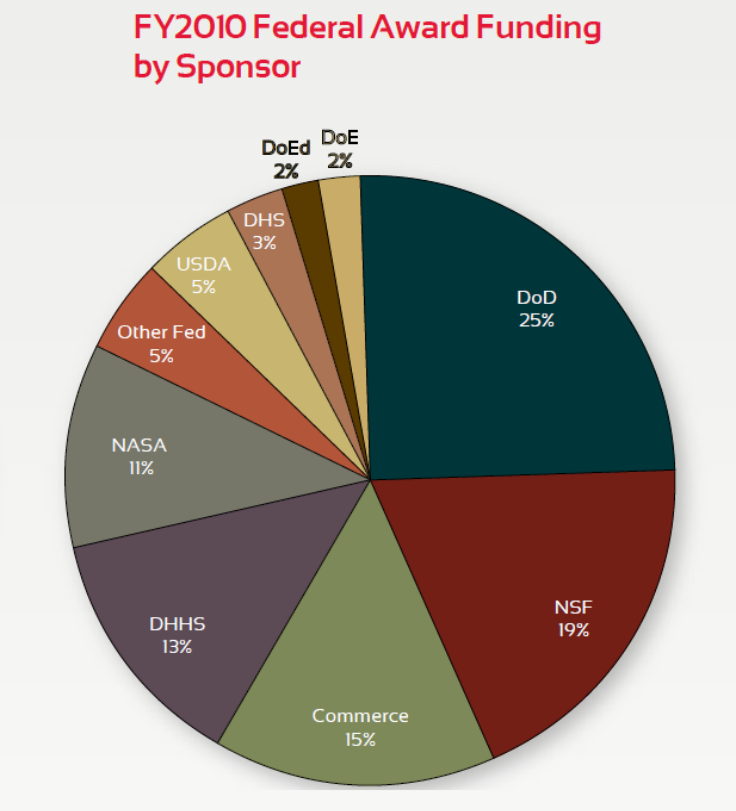


Figure 5.1: Pie Chart Distribution of Federal Funding (UMCP) (Division of Research, 2010)

Figure 5.1 and Table 5.1 show both the breadth and the depth with which UMCP attacks the federal government for funding. Nine departments are listed, each with no less than $8 million in awarded funding, and the "Other" category pulling in $20 million from various smaller departments. It is clear that UMCP is a well-recognized public university in terms of their faculty research, and its proximity to government office buildings in Washington, D.C. is one advantage they have over other universities. While the dollar amounts of UMCP's federal funding may appear significant compared to WPI, it is important to note that the faculty at UMCP outnumber WPI's by ten-fold.

5.1.3 Northwestern University (NU)

Northwestern University is a private research university with two major campuses in Evanston, IL and Chicago, IL. It is not a predominately science and technology based university like RPI nor does it have the advantage of being close to Washington, D.C. like UMCP; however, NU is still considered a premier research university. To combat the proximity issue, NU has a team located in Washington, D.C. that aid faculty in securing funding by directly contacting federal departments. Similar to UMCP, the research is focused in all disciplines. Comprised of eleven different schools, it is a top funded university, with $476.9 million awarded in Fiscal Year 2009 (for FY2010-11, NU has announced total awarded funding of $511.7

million) (Northwestern University, 2009). The distribution of the awards is shown in Figure 5.2, while Figure 5.3 illustrates the schools within NU that have received the awards.

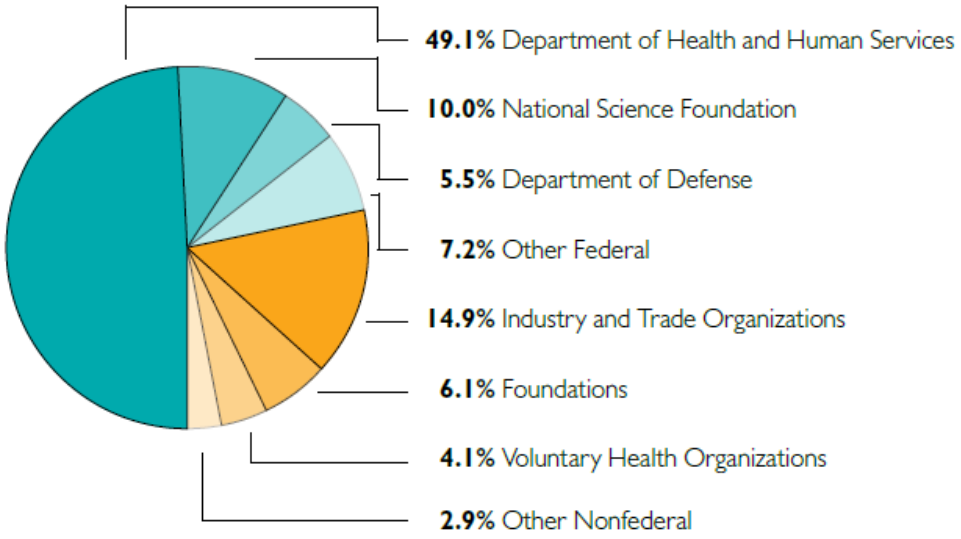


Figure 5.2: Funding Distribution by Source to Northwestern University (Northwestern University, 2009)

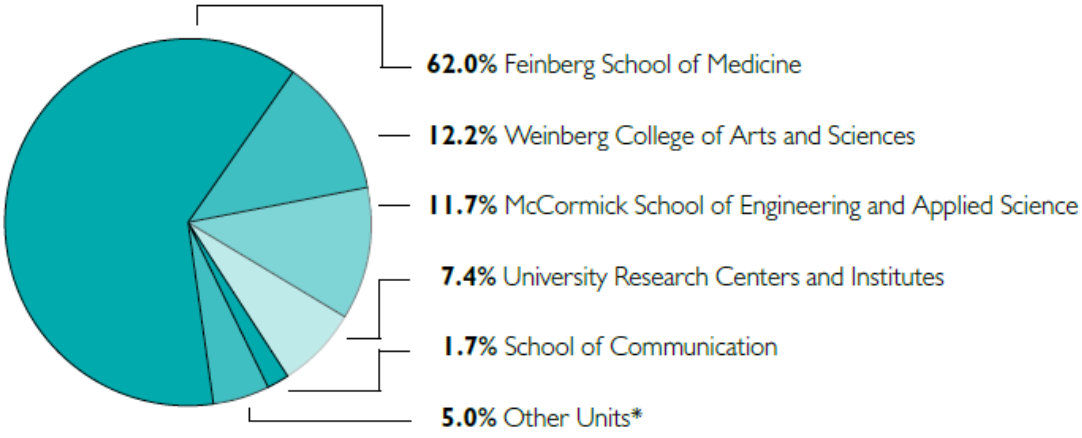


Figure 5.3: NU Awards by Administration Unit (Northwestern University, 2009)

According to Figures 5.2 and 5.3, NU predominantly receives funding for research in the fields of health and medicine, as 49.1% of funding comes from the Department of Health and Human Services and the Feinberg School of Medicine takes in 62% ($295.7 million) of total funding.

Both of these figures indicate that NU's research and success is heavily weighted upon the health and medicine fields more than any other field; this has occurred due to the great success they have had partnering with HHS. The HHS commands 68% of NU's federal funding, with the National Science Foundation second at 14%. From the data we analyzed that the school of engineering has shown success, bringing in around $55 million with only 122 faculty. NU has been able to tap into federal departments to secure roughly 26 times more funding than WPI.

While the size of NU's faculty is much greater than that of WPI, it is important to note that NU has had an overwhelming success with one specific branch of the federal government and WPI could use this strategy as a model for directing their proposals in search of awards. NU's college of engineering has not suffered because of the college of medicine's success. While NU is concentrating on their main source of federal funding income, they are not allowing their other schools to become stagnant and unsuccessful.

5.1.4 University Comparison

Table 5.2 compares the three universities alongside WPI in terms of funding success.

Table 5.2 Comparison of three universities with WPI

				
Total Funding($ Millions)	17.3	545	143	479.9
Funding per faculty($)	42,000	150,000	317,111	191,960
Ratio of success per faculty	1:1	3:1	7:1	4:1

According to the data, WPI is obtaining the least amount of funding for faculty research. The funding per faculty indicates that, despite being a smaller school than UMCP or NU, RPI operated much more efficiently while employing fewer faculty members. As shown in Table 5.2, using WPI as the base, the data indicates the rate of the success each of the universities' faculty members' experience. This data clearly illustrates WPI's lower success rate on a per faculty basis. The rate of success was calculated using the total number of faculty per institution, part-time and full-time.

5.2 Faculty Research Information Survey

The survey was created to gauge the research interests, current projects, and future endeavors of the faculty at WPI. The results of this survey are based on forty-three individual responses, approximately 10% of the faculty (both full-time and part-time) at WPI. Select

questions were reviewed and analyzed to facilitate our recommendations to WPI. The specific questions covered in this section are the following:

- What are your current primary research interests?
- From which agencies have you received federal funding in the past?
- What future projects do you plan to propose?
- Of the following, which methods do you use the most to determine which federal agency to send proposals to?
- What agencies do you believe provide the greatest opportunity for increased funding to WPI?
- Do you see opportunities in expanding your research to involve global project centers in some way?

While the data from the survey was represented by at least one faculty member from each department at WPI, the number of responses means the data gathered is incomplete. The project team acknowledged that the analysis of this data may not provide an accurate representation; this was taken into consideration when drawing conclusions from the data, and analysis of the faculty survey.

5.2.1 Primary Research Interests

The question, "What are your current primary research interests?" was to ascertain what were the current research areas and interests the faculty at WPI. These results are important because they helped to decide which agencies in Washington, D.C. would be best match for WPI to pursue. The following is a list of the main research categories WPI faculty report they are conducting currently, along with some examples of the research in that area.

- Bio/Biotechnology/Biomedical; Biomaterials, Genetics, Health Services.
- Chemistry/Biochemistry: Energy, Green Chemistry, Catalysts.
- Computer Science: Security, Education, Networking, Signal Processing.
- Environmental: Storm water Management, Sustainable Development Food Systems.
- Engineering: Fire Protection, Materials Science, Manufacturing.
- Humanities and Arts: 19^{th}-Century, Computer Games, Communications.
- Management: Entrepreneurship, Decision Making, Organizational Change.
- Physics: Atomic Physics.
- Robotics; Artificial Intelligence, Image Processing, Interaction.
- Social Sciences: Project-Based Learning, Science Education, Space Policy

The responses from the faculty made it easier to create our recommendations in the next section. The team used this data to match agencies that correlate with WPI's current research pursuits. While this is a small portion of the research, trends are still apparent, such as the large number of projects in healthcare related fields, biology, computer science, and robotics. This data identifies that certain WPI Faculty are researching topics in fields that commonly receive

funding from Government Agencies. The complete list of research interests is available in Appendix E.

5.2.2 Previous Federal Funding

The question "From which agencies have you received federal funding in the past?" was another way to understand where WPI have current relationships in federal agencies. These agencies were important to identify so WPI could continue to improve upon these relationships. Figure 5.5 shows the breakdown of which agencies faculty at WPI has received federal funding from in the past, though no time period was specified with respect to this question.

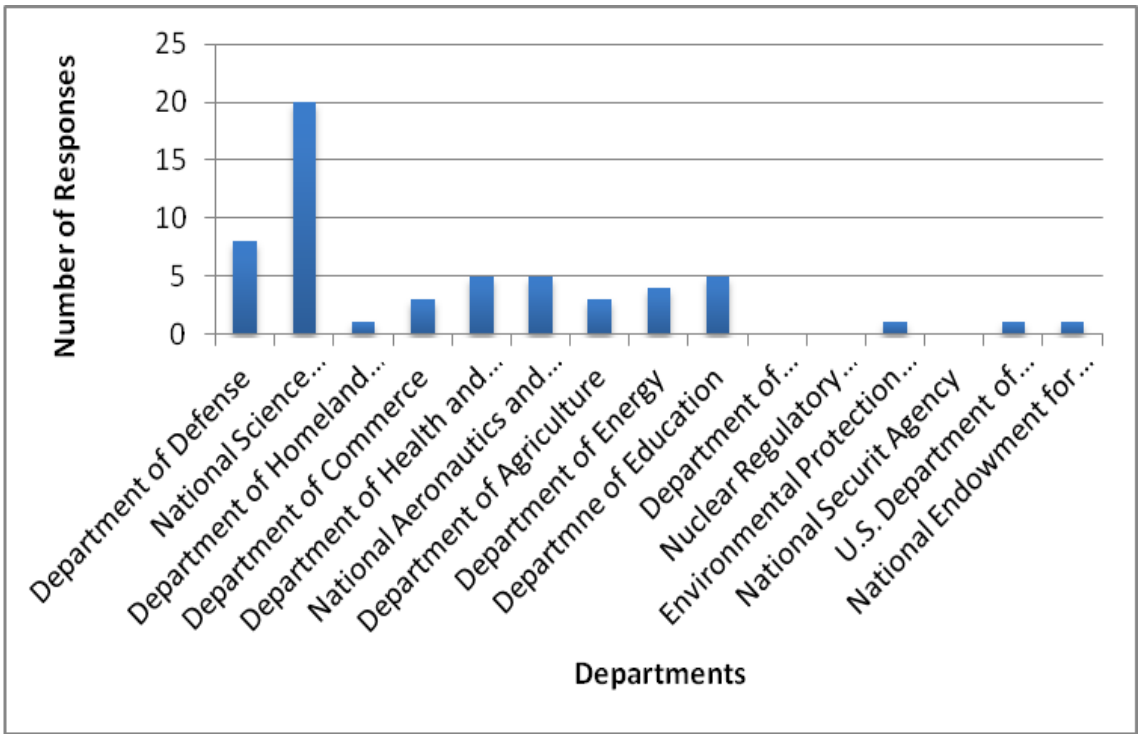


Figure 5.4: Distribution of Federal Funding for past WPI projects, according to WPI Faculty

The responses from this question are not a complete representation of where faculty has received funding from in the past, however, this data combined with the information from The Office of Sponsored Programs in Table 5.3 allowed us to create a relatively accurate picture of where WPI has received funding from in the past.

Table 5.3: Comparative Summary of Awards Received by Sponsor FY10 and FY09 (Office of Sponsored Programs, Winter 2010-11)

Sponsor	FY2010 No.	%	Amount	%	FY2009 No.	%	Amount	%
Federal								
Air Force	3	2.0%	$261,041	1.5%	4	2.9%	$218,549	1.6%
Army	11	7.2%	517,947	3.0%	14	10.1%	1,538,979	11.2%
DARPA	3	2.0%	252,621	1.5%	5	3.6%	350,036	2.6%
Department of Education	4	2.6%	588,738	3.4%	2	1.4%	786,299	5.7%
Department of Energy	6	3.9%	1,873,708	10.8%	3	2.2%	132,155	1.0%
Health & Human Services	16	10.5%	3,141,712	18.1%	12	8.6%	1,917,414	14.0%
Dept. of Homeland Security[1]	3	2.0%	1,444,144	8.3%	2	1.4%	222,403	1.6%
Department of Transportation	2	1.3%	104,839	0.6%	0	0.0%	0	0.0%
NASA	4	2.6%	321,773	1.9%	4	2.9%	257,376	1.9%
NIST	3	2.0%	1,378,548	7.9%	2	1.4%	207,437	1.5%
National Science Foundation	37	24.3%	4,522,426	26.0%	42	30.2%	6,069,327	44.3%
Navy	5	3.3%	314,313	1.8%	2	1.4%	64,514	0.5%
Other Federal	13	8.6%	967,232	5.6%	6	4.3%	276,494	2.0%
Subtotal - Federal	110	72.4%	$15,689,042	90.3%	98	70.5%	$12,040,983	87.8%
Commonwealth of Massachusetts	4	2.6%	63,932	0.4%	5	3.6%	320,054	2.3%
Corporations	28	18.4%	916,752	5.3%	23	16.5%	619,169	4.5%
Foundations	3	2.0%	310,556	1.8%	2	1.4%	110,088	0.8%
Foreign Organizations	3	2.0%	204,109	1.2%	2	1.4%	145,422	1.1%
Private Organizations	4	2.6%	190,070	1.1%	7	5.0%	191,234	1.4%
Public Organizations	0	0.0%	0	0.0%	2	1.4%	279,894	2.0%
Totals	152	100.0%	$17,374,461	100.0%	139	100.0%	$13,706,844	100.0%

[1]Includes Federal Emergency Management Agency (FEMA)

This data shows NSF, Health and Human Services, Department of Defense, and the Department of Energy as the top funders of WPI.

5.2.3 Future Research Projects

The question, “What future projects do you plan to propose helped the team gauge the direction of the direction that WPI faculty is pursuing in their research (due to the large volume of responses, not all projects are listed):

-A Study of Learning in Remote, Virtual, and Hands-on Laboratory Contexts
-Materials Processing
-Entrepreneurship
-Clinical Trials of Artemisia
-Fulbright K-12 Education Initiative with China and Japan
-Gyroscopes
-Chronic Disease Management
-Development of Porous Solid as Heterogeneous Catalysts
-Physical Human Robot Interaction
-Wind Energy
-Analog to Digital Converter

From this data the team found that WPI faculty has many plans for the future but not all are concrete. Many of the responses covered general topics, while others were much more specific. More than a few faculty members answered this question with a response of, "uncertain." This showed that not all faculty members have an idea of what research they wish to pursue in the future. This data helped facilitate the group's recommendations based on the future plans of WPI's faculty, which was important to take into account when looking at the future funding opportunities that will be available to WPI. All of the responses from this question can be found in Appendix E.

5.2.4 Methods to Target Agencies

The question, "Which methods do you use the most to determine which federal agency to send proposals to?" was used to determine how WPI faculty members obtained information on potential funding opportunities. The options available to them in the question were: The Office of Sponsored Programs, Colleagues, Independent Research of the Agency, Contacts Within the Agency, and Alumni Relationships. The data is compiled in Figure 5.6.

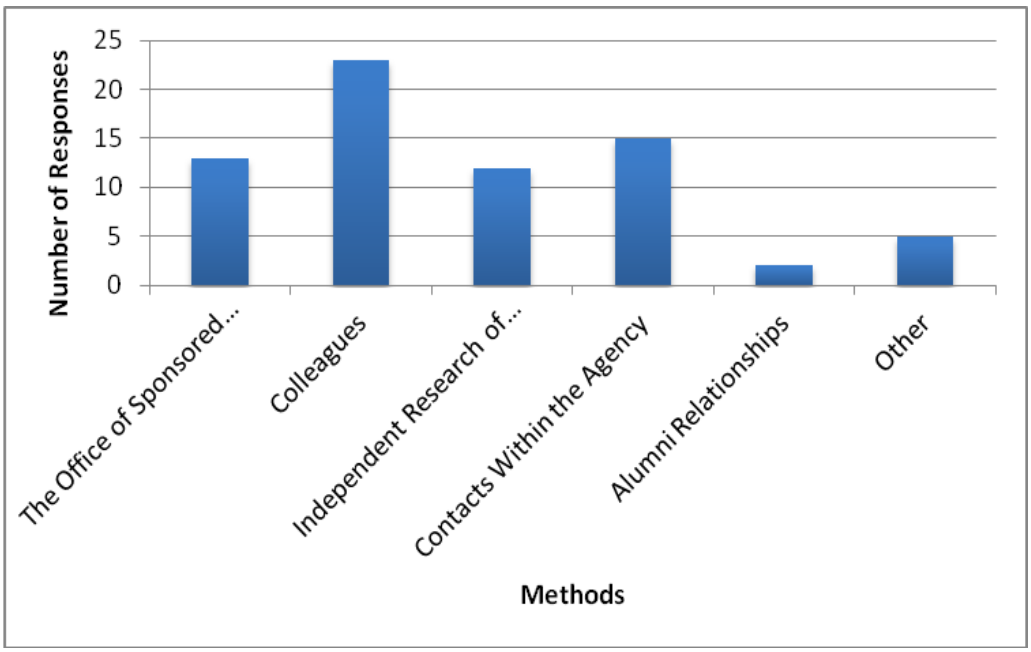


Figure 5.6: Methods to Target Federal Agencies

The "Other" category included a "please specify" requirement other mentioned included Agency Announcements, Mailing Lists, Web Searches, and Attending Meetings. From this data the team noticed that Alumni Relationships were being utilized significantly less than the other options. The database created by this IQP could be of use to the faculty because it provides another method to access information on agency funding opportunities, especially since faculty have the option to search the database for specific information.

5.2.5 Opportunities for Increased Funding

The data from the question, "What agencies do you believe provide the greatest opportunity for increased funding to WPI?" was very important for our project because it allowed the team to gain insight into which agencies the faculty thought would be the best for WPI to target. The data is displayed in Figure 5.7.

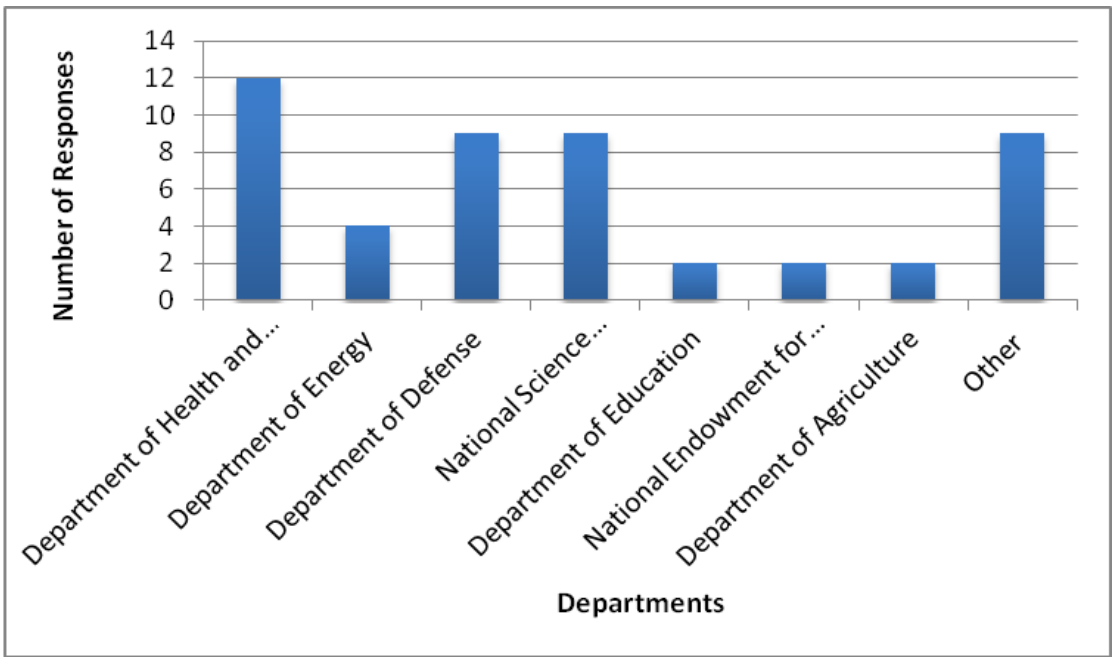


Figure 5.7: Sample of Responses from Question 6 of Faculty Survey

When creating the recommendations in the following section, the team took into account where WPI faculty is looking to get funding from for their projects. As you can see from Figure 5.7, the faculty is most interested in the Departments of Health and Human Services and Defense, along with the National Science Foundation. This data shows that these agencies could be prime candidates for partnership with WPI.

5.2.6 Expanding Research to Global Project Centers

This question, "Do you see opportunities in expanding your research to involve global project centers in some way?" was included because the IQP group decided to reach out to embassies in Washington, D.C. Therefore the team was interested to see if faculty at WPI were thinking about expanding their research to the global project centers. The results of this question were a response of, "yes" from nineteen (54%) of the faculty, and "no" from sixteen (46%) of the faculty.

There were other responses to this question as well. Some faculty members felt that it would depend on the location of the project center, while others dismissed global project centers and faculty research as a potential match. There were others who felt that the collaboration could lead to future research, and would expand the faculty's project work. It seems that the faculty is split on this question however, since a few did express interest, it may be possible others at WPI would be interested in expanding their research to project centers around the world. This data is addressed in the recommendations section. The comments from the faculty on this question can be found in Appendix E.

5.3 Federal Agency Research Overview

A deliverable of this project was to compile information on US federal agencies that play a role in extramural research funding. This information could be used by WPI faculty seeking new research projects based on their interests and the agenda of the agency. The projects team assembled a list of agencies to research listed here in alphabetical order:

- Department of Agriculture (USDA)
- Department of Commerce
- Department of Defense (DOD)
- Department of Education (DED)
- Department of Energy (DOE)
- Department of Health and Human Services (DHHS)
- Department of Homeland Security (DHS)
- Department of Justice
- Department of Labor
- Department of Transportation (DOT)
- Environmental Protection Agency (EPA)
- National Aeronautics and Space Administration (NASA)
- National Endowment for the Arts
- National Endowment for the Humanities
- National Science Foundation (NSF)
- National Security Agency (NSA)
- Nuclear Regulatory Commission
- US Department of Veterans Affairs (VA)

These agencies were selected based on their emphasis on supported external research and were compiled from the annual reports of WPI as well as the reports from the other universities used as case studies. This list represents the majority of agencies that support university funding. Each agency was addressed by researching sub-departments, divisions, offices, and branches, with respect to their programs, initiatives, and grants. Smaller agencies were only divided into a few departments whereas larger agencies, such as the Department of Energy, branched out much deeper. The research was extensive, but necessary in order to obtain a full list of the major programs in each agency agenda, and to pinpoint the location within the agency where the funding would be provided. From this data, the project team was able to make recommendations on areas of greatest potential between these agencies and WPI's programs.

5.4 Database and Software

The database is the storage center for the agency information collected from research during this past term. The storage center is well structured and robust for searching and inserting purposes. In order for the research to be easily accessible by faculty, software was created to specifically target the needs of faculty and researchers alike.

5.4.1 Database Architecture

The database is populated with tables specifically designed to provide the most in depth information and navigation through the agencies. A visual representation of the architecture of the database is shown in Figure 5.9. Each table is represented by a rectangle containing the name of the table at the top, with the different columns and their format directly underneath. The indexes are used for faster searching and the joining of related tables for more complex searching.

The parent table of the database is the “Agency” table, where the agency name, Uniform Resource Locator (URL), and general information are stored, such as the subjects that agency. This table is related to the “Department” table by a non-identifying one-to-many relationship, which stores only the name of the department, and serves as the parent table to the grants that department has given, and its sub-departments. The “Grant” table holds the title of the grant, the university that grant was given to, any information, and the amount. The “subDept” table keeps the name and specific information of the sub-department; and also serves as the parent to the “Office” table. The “Office” table holds the office name, information, and is a parent table to the “People” and “Branch” tables. The “Branch” table is used for larger Agencies, containing the smallest divisions and is a parent to the “People” table. Having two possible parents for the people table serves two purposes: for smaller agencies the Branch table can be bypassed to add people and for larger agencies the People table can be used to display an office head director. Finally the “People” table stores all information of a person such as their name, address, email, phone number, and any information that pertains to them, such as their specific job or contents of an interview.

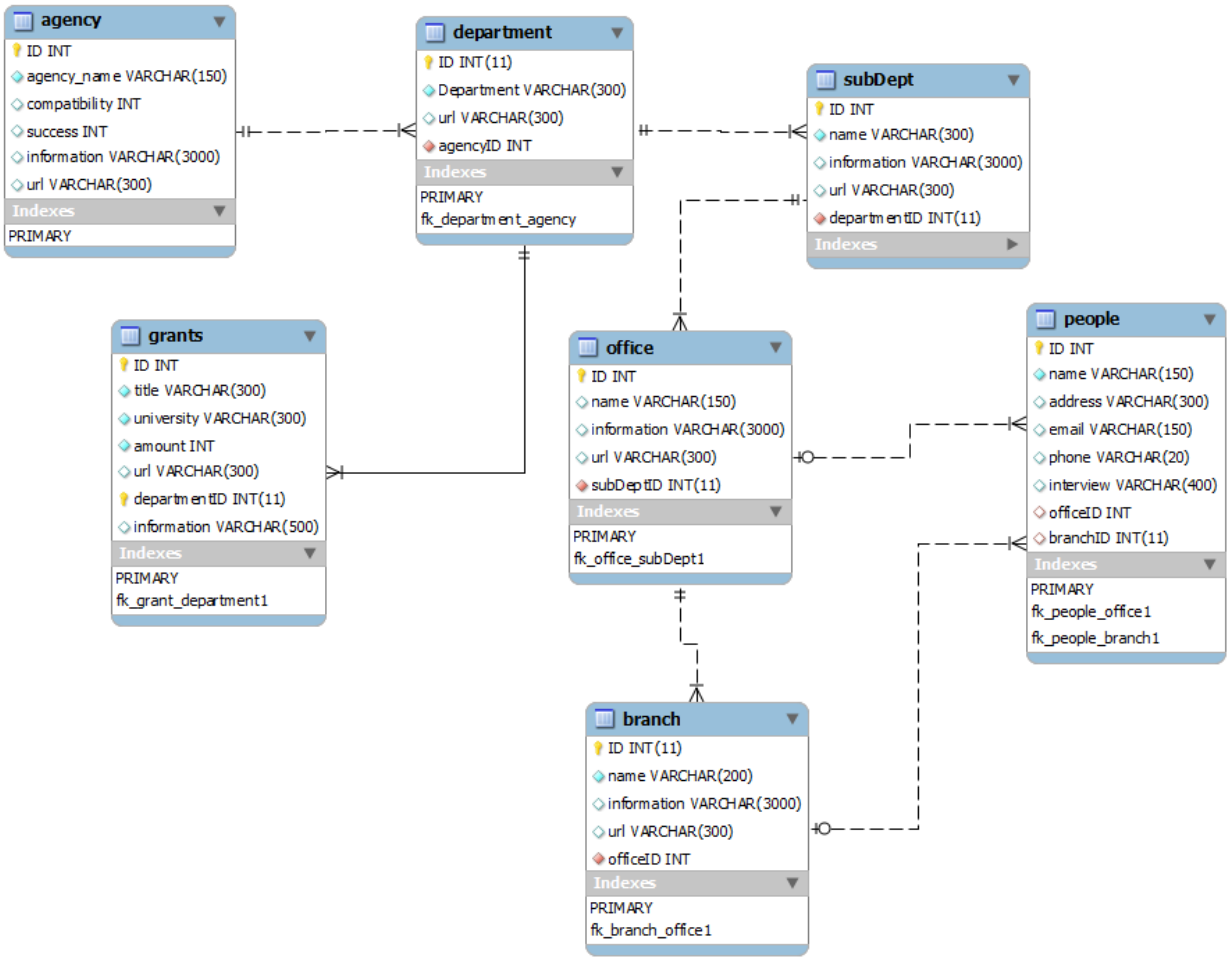


Figure 5.8: Database table relationships

Figure 5.8 displays the tables interconnected by database relationships. The dotted line represents a non-identifying relationship, where information in a child table can exist without its parent. The solid line represents an identifying relationship, where a row in the child table can only exist with a parent. This relationship is used where a grant cannot exist without a parent in the department table. The "crow's foot" represents a one-to-many relationship, where a row in the parent table can be connected to many rows in the child table. The office and branch tables are connected to the people table with a small circle on the non-identifying relationship line, this displays the ability for the relationship to be null. The reason this relationship is used is for a row in the People table to be "owned" by either the branch or office tables.

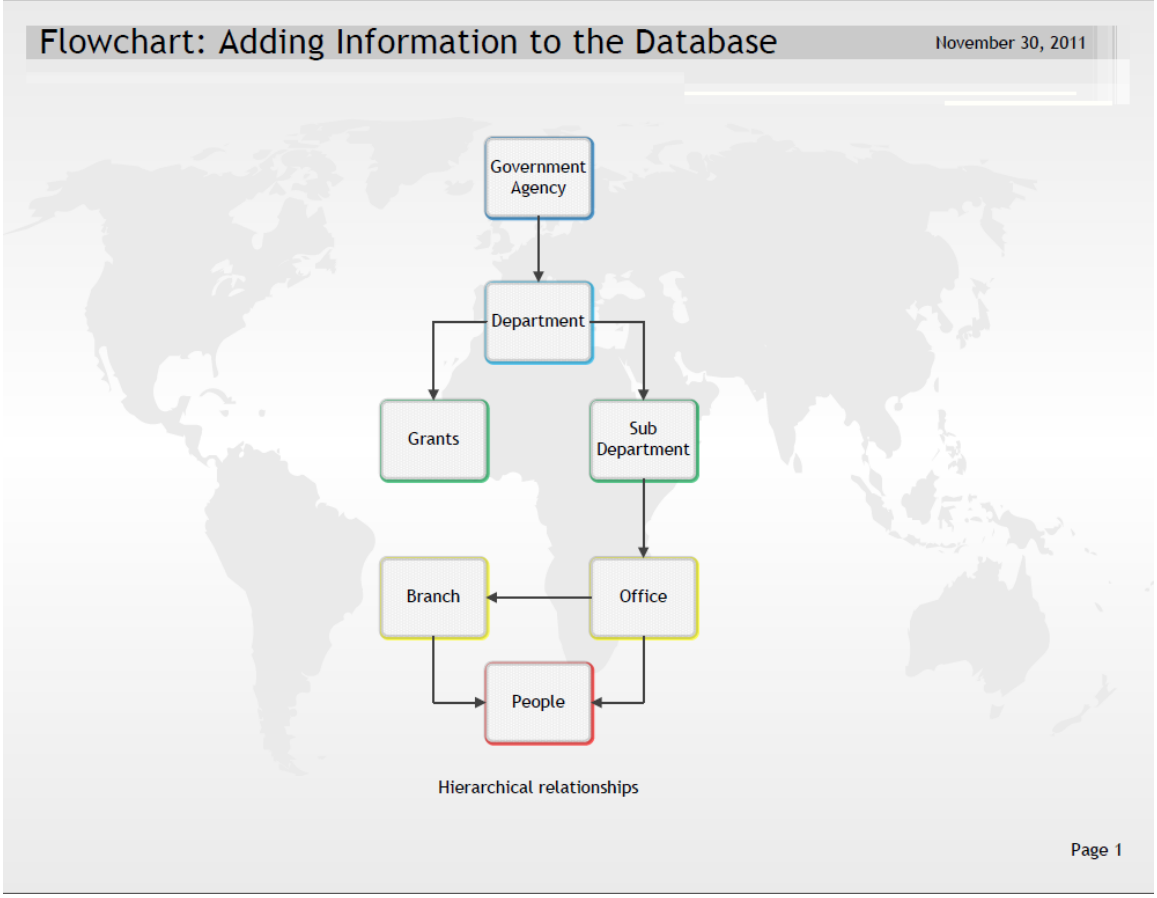


Figure 5.9: Flowchart for Adding Information to the Database

A simple way to visualize adding to the database is a hierarchy tree in Figure 5.9. This tree, also featured in the software, shows how the database is structured and implemented. The government agency needs to be added first, then the department. When the department is added, it will be linked to the agency selected by the user. Next the user can add Grants and Sub Departments to a department. Offices can be added to an existing Sub Department, and Branches and People can be added to an Office. Finally, a user can associate People to the Branch table.

5.4.2 Software

The software allows for the database to be accessible in a user friendly manner for faculty and staff. Supporting WPI's Agency Networking Service (SWANS) is a Java application available for download that allows for adding, editing, searching, and deleting from the Delphos database located on WPI's CCC mySQL server. The software is responsible for providing an intuitive user interface for accessing information in the database in a useful way for faculty. It is connected to the database via Java Database Connectivity (JDBC) specific to the mySQL server version. SWANS supports multithreading, allowing for the user to work the Agency Tree and the main adding and search panels separately. This reduces loading time for the user and provides a practical

user interface in a timely manner. A basic flowchart of the software shown in Figure 5.10 explains how the software is structured.

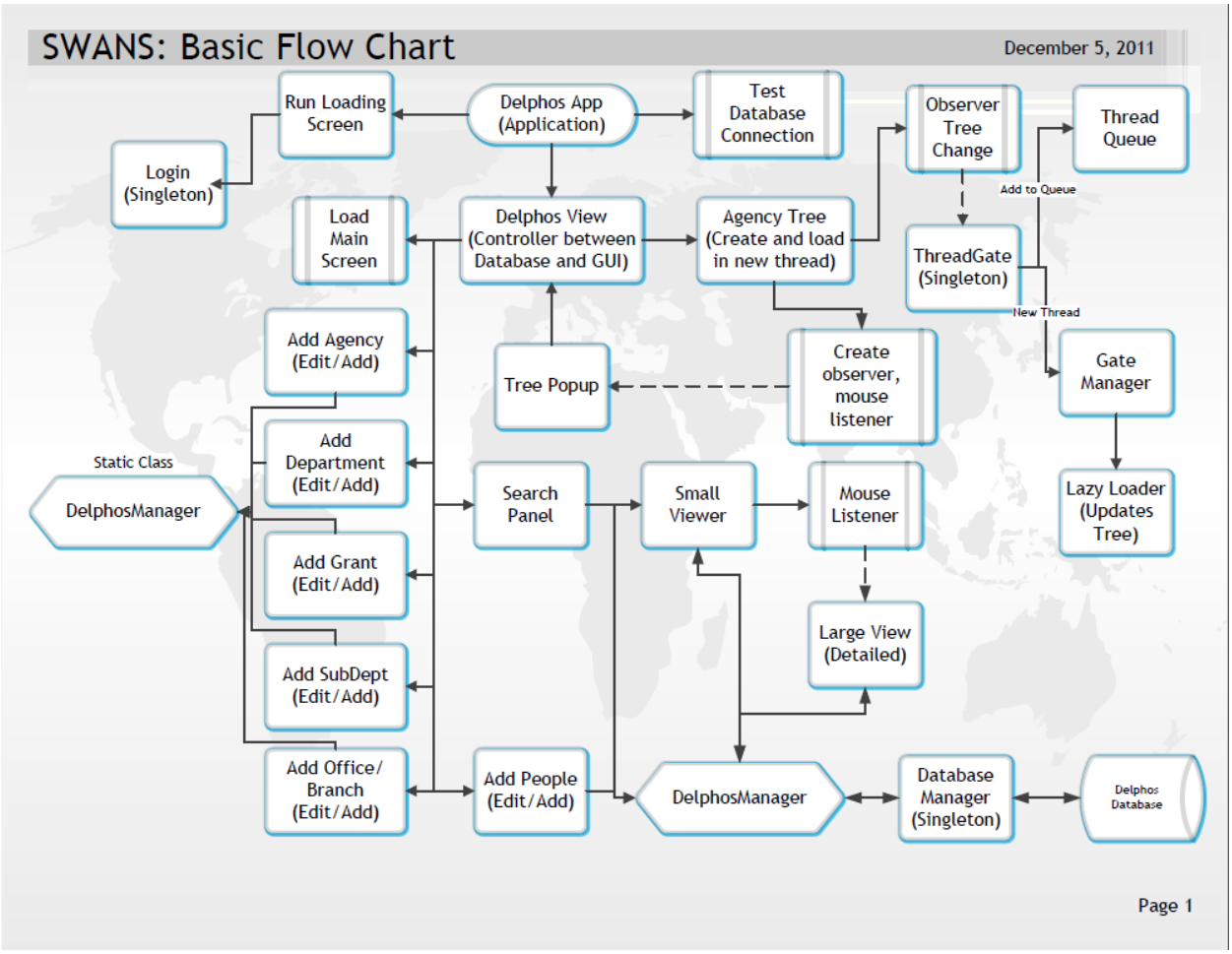


Figure 5.10: Basic Flow Chart for SWANS

The software is divided into two distinct sides, one side controlling the user interface, and the other performing back end tasks such as managing threads and loading the tree. A static class, DelphosManager, controls all interactions with the database manager: inserting, editing, deleting, and querying (searching). A singleton is a class where only one instance is able to be created during runtime to avoid possible duplications. The login class, shown in Figure 5.10, is one such class; it allows for the type of user (researcher or faculty) to be stored in that object throughout the application to determine the set of restrictions to the database.

A faculty member has the ability to search and view the entire database, but can only add grants to help keep the database updated. Faculty members are unable to delete information from the database to protect from accidental data loss. Researchers have the ability to take advantage of all the features of the software, and have no restrictions on the database.

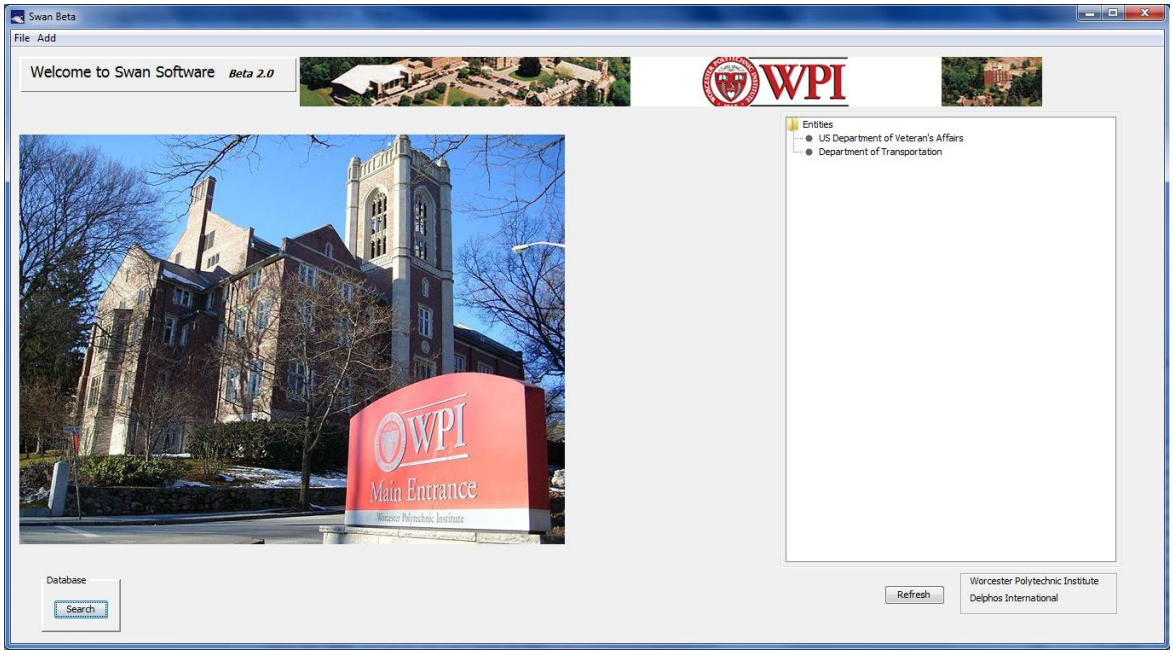


Figure 5.11: SWANS Beta Start-up Screen

The start-up screen displays a tree (with two agencies) on the right hand side, and a welcome picture on the left as shown in Figure 5.11. By clicking on one of the agencies, the tree will load all the departments of the agency and display them for the user to see. This feature is called Lazy Loading; it saves processing time on the initial start of the program and allows for the application to respond quickly. An expanded tree is shown in Figure 5.12, displaying all the children under the Department of Transportation.

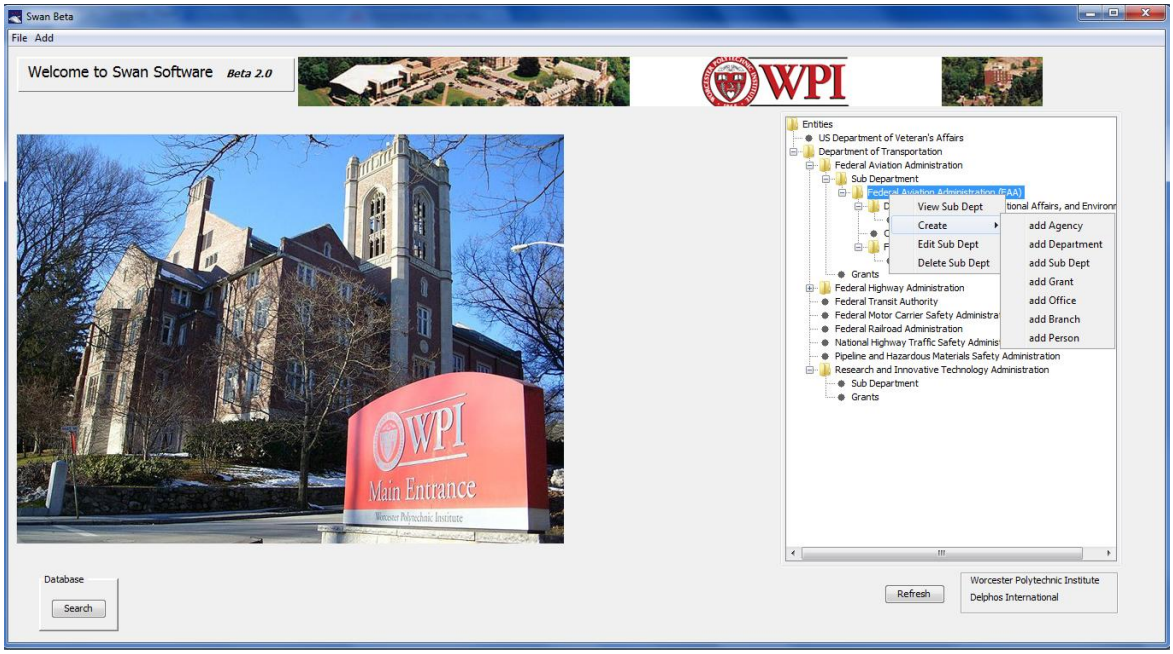


Figure 5.12: SWANS Expanded Tree and Right Click Functionality.

Figure 5.12 also displays the software's right click capabilities. Upon right clicking on the tree a small menu will popup displaying four options: view, create, edit, and delete. If the user scrolls the mouse over the Create button, another menu will be displayed prompting the type of entity to add to the database. This right click capability places all the necessary controls in an easy to use and understandable format in order to reduce confusion as to where buttons are located in the software. For convenience, there is an "Add" button near the file menu in the top left corner, and key shortcuts; such as Ctrl-A to add an agency. On the bottom left hand corner of the application there is a search button. Upon clicking the search button a pane will appear with basic search capabilities as shown in Figure 5.13.

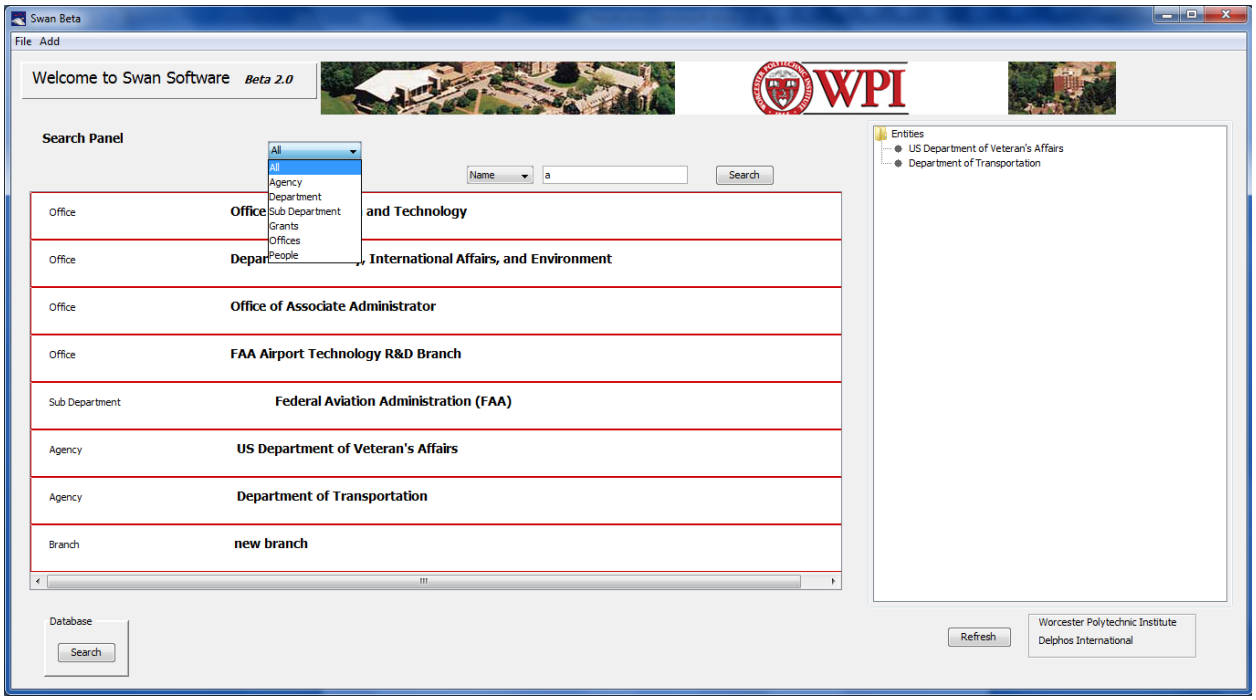


Figure 5.13: Basic Search through every table in the database.

This search pane offers numerous search abilities from searching through everything in the database to searching through specific agencies for sub-departments. The combination box that is open in Figure 5.13 displays all of the tables the user is able to search through individually, and is defaulted to "All" for a quick search through the entire database. This figure displays all of the results returned when a search for the letter "a" in the name field is completed. A user may specify what tables to search through and certain columns. More advanced users can search through sub departments, and by clicking on an agency the search will only return information under that agency. The returned information is displayed in a simple viewer with the title and what type of entity has been recalled. By clicking on one of these panels a larger view will be displayed for a more in depth look as shown in Figure 5.14.

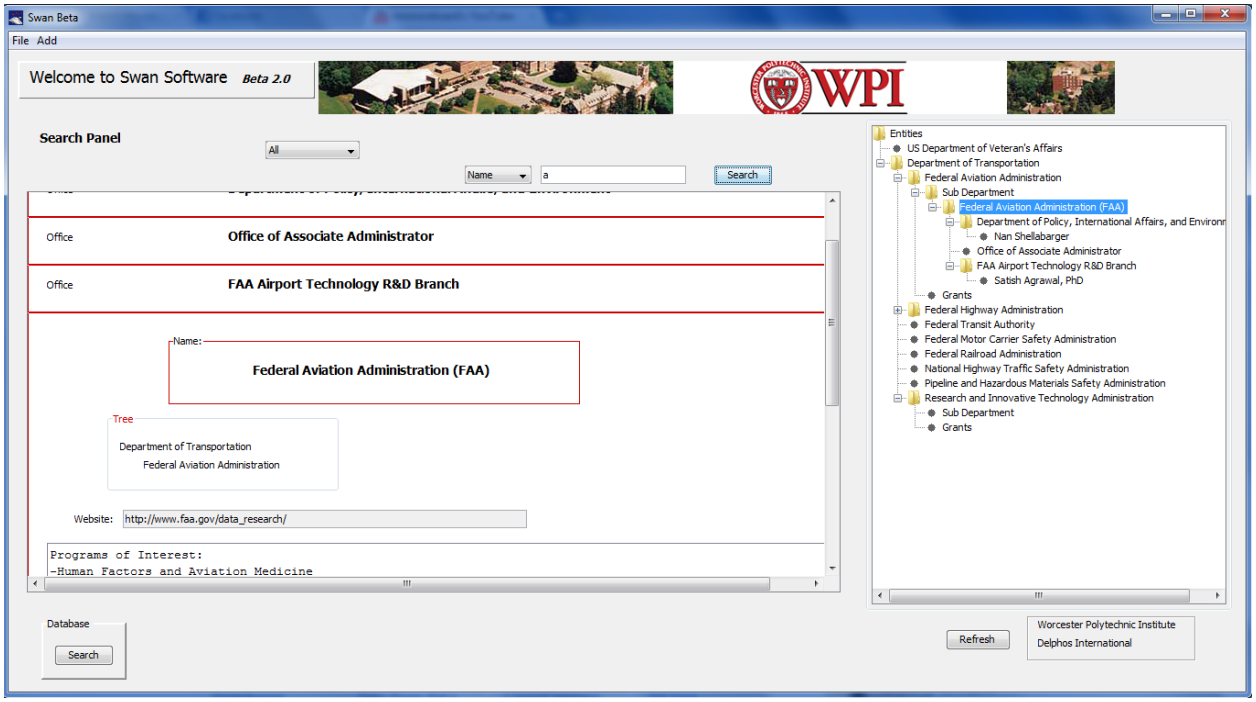


Figure 5.14: Search and In-Depth Display.

After clicking one of these small viewers, a larger view is displayed where this particular entity is located in the tree and any other information stored in the database. In the case of a sub department as shown in Figure 5.14 a website is displayed along with information about this particular sub department. Notice the other values returned in the search are still shown and are available for expanding into a larger view.

SWANS is tailored to fit the needs of faculty and researchers to add to the database and search through it with ease in a timely manner. The database and software deliverables convey government agency research in an easy to use and identifiable manner. Two manuals, user and technical, are included in Appendices F and G, respectively, for future reference and greater detail in utilizing the full capabilities of the software.

5.5 Embassy Visits

The project team visited two foreign embassies in Washington, D.C, the South African Embassy and the Royal Thai Embassy, to have discussions with embassy personnel. These discussions included:

- A history of WPI involvement in the respective country
- An overview of the Global Perspectives Program
- Types of projects being completed
- Recent projects being completed
- GE Foundation Proposal (Cape Town)
- Foreign student involvement (Thailand)

Overall these meetings were very successful, and the team found the representatives to be very interested in WPI's programs. The goal of the meeting was for the team to make initial contact with the embassies. In the future, WPI staff can continue to promote WPI's relationships with these countries, with the intention of fostering ties that could lead to more projects sponsored by their governments.

During the meetings, the project team also gave out a packet containing pre-existing information on WPI and its project based learning. In addition a pamphlet that the team created for the specific embassies was added explaining the nature of the IQP and the recent projects completed in the respective country. Contact information for the Dean of the IGSD and the Directors of the specified project centers were included in the packet as a means for the embassy to follow up.

5.6 Alumni Involvement

Alumni working inside the Beltway, especially those with careers in the government could be an important additional component to this project in terms of their involvement in the long term. WPI alumni in the relevant agencies may be helpful to faculty in identifying specific areas of agency interest, assisting with contacts with the appropriate people, and in assuring that the faculty has obtained all relevant publicly available information. Of course, government personnel may not be in the position of favoring WPI over any other proposer; however their knowledge can still be beneficial. The alumni can also use the database and the software as a useful tool in order to help secure funding from the government. The project team obtained a list of alumni working inside the Beltway and selected a group of alumni with careers in several different agencies. This group, along with individuals suggested by the team's sponsor and project advisors, were invited to the final presentation, where they were be introduced to the database.

Chapter 6: Conclusion and Recommendations

In this project, the team sought to increase the awareness of WPI in Washington D.C, by creating a knowledgebase to help WPI faculty and staff increase their success in obtaining funding for their research agendas. The knowledgebase comes in the form of a database linked to software, allowing for easy utilization and implementation. The team also made introductions on behalf of WPI to foreign embassies located in Washington D.C, in an attempt to expand and strengthen the relationships for select global project centers. The following sections detail a summary of the results, any conclusions that were drawn from them, and the project team's recommendations for which agencies to target, the utilization of the software, and the continuation of the project.

6.1 Summary of Results

This section provides a summary of the project team's results. It includes the completion of US federal agency research regarding their programs and initiatives, the implementation of the database and software, and the results from the visits to the foreign embassies of South Africa and Thailand.

6.1.1 Agency Research

The major research portion of the project focused on the US federal agencies: organizing and classifying them by their departments, divisions, and offices, along with the corresponding programs and grants available for academic research. In addition, contact information for the individuals in charge of these programs was researched giving WPI faculty the potential to connect and build a relationship with a particular office. There were instances where divisions within agencies focused on 'in house' research rather than extramural research and were therefore omitted from our records. However, they need to be monitored in the event that their agenda changes to include extramural funding. The information on all the agencies listed in the results section was completed and inserted into the database.

6.1.2 Database

The database serves as a literal representation of a knowledgebase of government agencies. It stores valuable research in a uniform and searchable manner. The information is accessible, and readily available to WPI faculty, allowing for constantly updated material when researchers are adding to the database. The Delphos Database can be easily expanded in the future, allowing for embassies, foundations, and corporations to be added. These will be necessary should the Global Perspective Program, or students who desire sponsors for an MQP, wish to have easier access to information leading to funding. As a recommendation, the database should be migrated to a more secure or dedicated server rather than the CCC mySQL server for faster searching. Depending on the type of

mySQL server, the Java Database Connectivity (JDBC) within SWANS will have to be updated to the corresponding version of the server.

6.2 Conclusion from Results

The following section will contain the conclusions drawn by the project team from the analysis of their results. Most notably, the conclusions made from the case studies of other universities will be compared against the results from the faculty survey to make an assessment of where WPI currently stands in their academic research success.

6.2.1 Case Studies

The results from the university case studies indicate these other universities have great success in obtaining funding from the federal government. These universities can be models for schools such as WPI because of the successful methods they have used. Even though the schools themselves are larger and have more faculty members, proportionally their faculties are demonstrating greater success in obtaining funding.

6.2.2 Faculty Survey

Through our faculty survey, the project team can conclude that WPI faculty members are engaged in cutting-edge research on campus and some have future agendas they wish to pursue. The team believes the faculty is dedicated to their research and has been trying very hard to push their proposals to the right people and get the adequate funding for their projects.

6.3 Recommendations

6.3.1 Areas of Greatest Potential

Through research of agency agendas, and the analysis of the faculty survey, the project team has highlighted agencies that have the greatest potential for collaboration with program initiatives and proposals from WPI faculty. While all of the departments listed in the database support WPI's programs in some capacity, the team has identified four departments with the greatest potential for WPI:

1. Department of Health and Human Services
2. Department of Defense
3. National Science Foundation
4. Department of Energy

The Department of Health and Human Services is the leading research department in the life and medical sciences. Considering WPI's construction of Gateway Park, the fields of interest by WPI faculty, and the overall increase in the life sciences department, HHS and its own agenda would be a top choice to increase proposals. The Department of

Defense and the National Science Foundation are the top two departments funding WPI research, as evidenced from OSP reports and the faculty survey. However, the DOD is the largest research department in the government and the NSF is the leading department in terms of funding for WPI. A fourth priority is the Department of Energy. This recommendation is also based on the fact that it is a major research agency in the federal government. The DOE's research agenda is very compatible to the research conducted at WPI, specifically in the search for new, sustainable sources of fuel. It is important that the faculty can exhaust all programs within their interests from these agencies.

6.3.2 Utilizing the software

Supporting WPI's Agency Networking Service (SWANS) was developed for WPI's faculty and future agency researchers. Upon login, SWANS will be configured to either researchers or faculty to allow for certain restrictions to the database. This software should be presented to individuals such as WPI's Deans to convey the opportunities SWANS can bring to gaining funding for research projects. Once these presentations are complete, the software should be demonstrated one-on-one to select faculty who submit proposals regularly to get feedback. This should also be done within the Office of Sponsored Programs, where a select few are able to see the results and extent of the database and software. After these three steps, a larger presentation should be given to the majority of faculty who use government agencies to fund projects and to the Office of Sponsored Programs, since they will have the ability to add to the database. This presentation may need the support of the Deans to have faculty attend, and to push faculty to initially use the software. At the end of this presentation, SWANS should be deployed to an online site for downloading and use.

6.3.3 Follow-up with embassies

The project team highly recommends the IGSD department at WPI to follow up with the foreign embassies in Washington, D.C. to discuss expanding current project centers. The team's meetings with the South African Embassy and the Royal Thai Embassy showed strong indications of the foreign governments' willingness to collaborate with WPI students and create more projects to further the current mutual relationship. Due to the positive response from both embassies, the team additionally recommends the IGSD department to contact all of the foreign embassies in Washington D.C. whose nation hosts a WPI project center. Presenting these embassies with materials on WPI's success will raise awareness and initiate negotiations to investigate the possibility of gaining a greater involvement from foreign governments.

6.3.4 Continuation of Project

This project is by no means a one-time IQP. Future IQP projects on this topic can seek to update all government agency agendas, as well as expanding the database to include private foundations, non-governmental organizations (NGOs), development agencies, and corporations with similar agendas to WPI faculty. Projects could also seek

to get greater alumni involvement in this process. From the standpoint of the school's relations, the introductions made with the foreign embassies should be followed up on in an attempt to foster relationships with project center hosts.

Our final presentation generated discussion from the alumni guests on the possibilities prompted by this project. Many alumni suggested SWANS be introduced to the faculty soon, as to gain feedback and improve this software as needed, then be deployed for use. One notable alumnus suggested a small presentation be given for the deans at WPI, in order to raise awareness of this tool. Other alumni suggested that this software be deployed to faculty in conjunction with grant writing seminars. Another went as far as to say, "Have a person within a federal agency research and meet with proposal examiners to create a layout of a great, successful proposal. This outline would layout the 'needs' of the proposal and how to write that section. This way, these proposals could be generic for junior faculty looking to receive funding yet have a higher success rate." Through the use of SWANS to target specific branches within agencies, and with improved grant writing, there should be a higher chance of success for faculty to receive funding.

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Appendices

Appendix A – Delphos International

Delphos International is a private corporation founded in 1985 that provides financial advice for their clients (Delphos International, 2011). Delphos are experts at obtaining and structuring funds necessary from government agencies worldwide. These funds are provided as loans grants and equity.

A small company incorporated in Delaware and based in Washington D.C, Delphos has supported the efforts of over 1000 companies and has arranged over 10 billion dollars. Notable projects include the securing of 750 million dollars for AES Corporation to build a lignite power plant in Bulgaria, the largest greenfield investment in southeastern Europe to date. For this accomplishment, Delphos was awarded *Project Finance Magazine's* Deal of the Year in 2005. They have also won this award two other times for their role as financial advisors; in 1999 in cooperation with AES on a merchant power plant in Argentina, and, most recently, one in 2009 in cooperation with the Government of Botswana on a coal-fired power project.

As financial consultants, Delphos International, led by its founder and CEO, William Delphos, has spent over 30 years building relationships with government organizations. When a company approaches Delphos with their proposal, Delphos determines a plan of attack that is centered on aligning the project proposed with government agencies that have similar agendas. Delphos has successfully financed projects in numerous industries such as power, telecommunications, and hospitality. A multitude of languages are spoken amongst the staff, which allows the company to successfully cooperate with companies all over the world. In addition to the headquarters located on K Street in Washington D.C., Delphos International also has offices in New York City and Kuala Lumpur, Malaysia.

As previously mentioned, Delphos is a small team of 15 professionals. It's CEO and founder, William Delphos heads the company and works out of Washington D.C. There are 3 Vice Presidents in the company who are based at each of the three locations. The remainder of the company's employees holds positions as financial analysts and interns.

Appendix B – What is an IQP and how does our project qualify as an IQP

An IQP is an interdisciplinary project where students address a societal problem using a combination of math and science. These projects are part of the curriculum because they teach students how science and technology are related to society, and how by using that technology many different types of problems can be solved.
Our project qualifies as an IQP because this project promotes technology. The purpose of our project is to help WPI receive more funding. By promoting WPI, and securing funding for the institution we are promoting scientific research, and innovation. This project is focusing on the agencies in Washington, D.C., and how they choose to fund certain types of scientific research and technology. We will learn from this project how changes in technology and science affect the business and economic world, especially in Washington, D.C.

Appendix C – The Office of Sponsored Programs

Table C.1: Sponsors of WPI (WPI, Office of Sponsored Programs, 2011)

Alfred P. Sloan Foundation	Private
American Cancer Society	Private
American Chemical Society - Petroleum Research Fund	Private
Army Research Office (ARO)	Federal
Carnegie Corporation of New York	Private
David and Lucile Packard Foundation	Private
Department of Agriculture (USDA)	Federal
Department of Commerce • National Institute of Standards and Technology (NIST) • National Oceanographic and Atmospheric Administration • National Telecommunications and Information Administration	Federal
Department of Defense (DOD)	Federal
Department of Education (DED) • Grant Opportunities	Federal
Department of Energy (DOE) Office of Science • Business Opportunities	Federal
Department of the Interior (DOI)	Federal
Department of Justice (DOJ)	Federal
Department of Labor (DOL)	Federal
Department of Health and Human Services (DHHS)	Federal
Department of State (DOS)	Federal
Department of Transportation (DOT) • Acquisition and Grants	Federal
Electric Power Research Institute (EPRI)	Private
Energy Foundation	Private
Environmental Protection Agency (EPA)	Federal
Eurasia Foundation	Private
Faculty Advancement in Research (FAR) - cancelled until further notice	Internal

Federal Business Opportunities	Federal
Grants (Government Grants)	General
Grants.gov	Federal
Henry Luce Foundation	Private
Indirect Costs Incentive Fund	Internal
James S. McDonnell Foundation	Private
Jet Propulsion Laboratory	Other Federal-related
John D. and Catherine T. Macarthur Foundation	Private
Lawrence Berkeley National Laboratory	Other Federal-related
Lawrence Livermore National Laboratory	Other Federal-related
Los Alamos National Laboratory	Other Federal-related
Massachusetts Renewable Energy Trust	Commonwealth of Massachusetts
Massachusetts Technology Collaborative	Commonwealth of Massachusetts
MTC Federal Funding Program	Commonwealth of Massachusetts
National Cooperative Highway Research Program (NCHRP)	Federal
National Aeronautics and Space Administration (NASA) • Aerospace Technology • Office of Space Flight	Federal
National Endowment for the Arts	Federal
National Endowment for the Humanities	Federal
National Renewable Energy Laboratory	Other Federal-related
National Science Foundation (NSF) • Guide to Programs • Deadline Dates	Federal
Naval Research Laboratory (NRL)	Federal
Oak Ridge National Laboratory	Other Federal-related
Office of Naval Research	Federal
Pew Charitable Trusts	Private
Research Corporation	Private
Research Development Council (RDC)	Internal

Russel Sage Foundation	Private
Sandia National Laboratories	Other Federal-related
The Center for Economic Studies	Federal
The Rockefeller Foundation	Private
Robert Wood Johnson Foundation	Private
U.S. Fire Administration (USFA)	Federal
U.S. Institute of Peace	Federal
W. M. Keck Foundation (Institutional Proposals Only)	Private
W. K. Kellogg Foundation	Private

Table C.2: Summary of Awards Received by Sponsor (Office of Sponsored Programs, Winter 2010-2011)

Worcester Polytechnic Institute
Comparative Summary of Awards Received by Sponsor
FY2010 and FY2009

	FY2010				FY2009			
Sponsor	No.	%	Amount	%	No.	%	Amount	%
Federal								
Air Force	3	2.0%	$261,041	1.5%	4	2.9%	$218,549	1.6%
Army	11	7.2%	517,947	3.0%	14	10.1%	1,538,979	11.2%
DARPA	3	2.0%	252,621	1.5%	5	3.6%	350,036	2.6%
Department of Education	4	2.6%	588,738	3.4%	2	1.4%	786,299	5.7%
Department of Energy	6	3.9%	1,873,708	10.8%	3	2.2%	132,155	1.0%
Health & Human Services	16	10.5%	3,141,712	18.1%	12	8.6%	1,917,414	14.0%
Dept. of Homeland Security[1]	3	2.0%	1,444,144	8.3%	2	1.4%	222,403	1.6%
Department of Transportation	2	1.3%	104,839	0.6%	0	0.0%	0	0.0%
NASA	4	2.6%	321,773	1.9%	4	2.9%	257,376	1.9%
NIST	3	2.0%	1,378,548	7.9%	2	1.4%	207,437	1.5%
National Science Foundation	37	24.3%	4,522,426	26.0%	42	30.2%	6,069,327	44.3%
Navy	5	3.3%	314,313	1.8%	2	1.4%	64,514	0.5%
Other Federal	13	8.6%	967,232	5.6%	6	4.3%	276,494	2.0%
Subtotal - Federal	110	72.4%	$15,689,042	90.3%	98	70.5%	$12,040,983	87.8%
Commonwealth of Massachusetts	4	2.6%	63,932	0.4%	5	3.6%	320,054	2.3%
Corporations	28	18.4%	916,752	5.3%	23	16.5%	619,169	4.5%
Foundations	3	2.0%	310,556	1.8%	2	1.4%	110,088	0.8%
Foreign Organizations	3	2.0%	204,109	1.2%	2	1.4%	145,422	1.1%
Private Organizations	4	2.6%	190,070	1.1%	7	5.0%	191,234	1.4%
Public Organizations	0	0.0%	0	0.0%	2	1.4%	279,894	2.0%
Totals	152	100.0%	$17,374,461	100.0%	139	100.0%	$13,706,844	100.0%

[1]Includes Federal Emergency Management Agency (FEMA)

Table C.3: Summary of Fiscal Year 2010 Activity (Office of Sponsored Programs, Winter 2010-2011)

I. THE YEAR IN BRIEF - A SUMMARY OF FISCAL YEAR 2010 ACTIVITY (WITH COMPARATIVE FY2009 INFORMATION)

		FY2010	FY2009	% Change Inc./(Dec.)
1.	Number of Proposal Submissions	344	312	10.3%
2.	$ Composition of Proposals Submitted			
	Direct Costs	$141,624,238	$98,210,757	44.2%
	Indirect Costs	43,726,464	28,373,820	54.1%
	Totals Requested	$185,350,701	$126,584,577	46.4%
	Cost Sharing	3,003,883	4,176,191	(28.1%)
	Total Project Costs Proposed	$188,354,584	$130,760,768	44.0%
3.	Number of Proposals (Net of Congressional Funding)	344	311	10.6%
4.	$ Volume of Proposals (Net of Congressional Funding)			
	Direct Costs	$141,624,238	$96,722,570	46.4%
	Indirect Costs	43,726,464	27,657,057	58.1%
	Totals Requested	$185,350,701	$124,379,627	49.0%
	Cost Sharing	3,003,883	3,230,191	(7.0%)
	Total Project Costs Proposed	$188,354,584	$127,609,818	47.6%
5.	Number of Award Actions	152	139	9.4%
6.	$ Composition of Award Actions Received			
	Direct Costs	$13,181,013	$10,707,802	23.1%
	Indirect Costs	4,193,448	2,999,042	39.8%
	Total Award $ Received	$17,374,461	$13,706,844	26.8%
	Cost Sharing	1,491,384	1,015,414	46.9%
	Total Project Costs	$18,865,845	$14,722,258	28.1%
7.	Number of Award Actions (Net of Congressional Funding)	151	139	8.6%
8.	$ Composition of Awards (Net of Congressional Funding)			
	Direct Costs	$13,019,344	$10,707,802	21.6%
	Indirect Costs	4,110,117	2,999,042	47.0%
	Total Award $ Received	$17,129,461	$13,706,844	25.0%
	Cost Sharing	1,430,134	1,015,414	40.8%
	Total Project Costs (Net of Congressional Funding)	$18,559,595	$14,722,258	26.1%
9.	Selected Proposal Coordination Form (PCF) "Special Considerations" Summary Data:			
	a. Proposals Involving Human Participants	47	36	30.6%
	b. Proposals Involving Use of Animals	14	22	(36.4%)
	c. Proposals Involving Hazardous Materials	28	14	100.0%
	d. Proposals Requesting Support for Research Assistants	203	177	14.7%
	e. Proposals Requesting Support for Non-Student Personnel	100	70	42.9%
	f. Proposals Including Funds for Consultants/Subcontractors	51	51	0.0%
	g. Proposals with Academic Year Faculty Salary Budgeted	47	51	(7.8%)
	h. Proposals Requesting Equipment Funds	115	108	6.5%

Table C.4: Summary of Sponsored Program Expenditure Activity by Department (Office of Sponsored Programs, Winter 2010-2011)

Worcester Polytechnic Institute
Summary of Sponsored Program Expenditure Activity by Department
July 1, 2009 - June 30, 2010

Dept.	Cost Sharing	Salaries & Wages	Fringe Benefits	Equipment	Other Direct Costs	F&A Costs	Grand Totals	Excess of F&A Costs over C.S.	Faculty & Staff S&W	Student Stipends
BBT	$(10,590)	$311,459	$59,420	$20,675	$189,498	$246,132	$816,594	$235,542	$221,716	$89,743
BEI	(5,834)	379,336	67,426	58,706	229,183	306,469	1,035,286	300,635	$251,590	127,746
BME	(44,199)	264,984	25,172	3,017	179,014	152,441	580,430	108,242	$93,925	171,059
CM	(97,821)	503,089	60,645	293,129	632,784	335,940	1,727,766	238,119	$226,287	276,802
CBC	0	203,621	44,614	12,111	71,684	157,812	489,843	157,812	$166,470	37,151
CEE	(34,048)	197,432	30,589	22,227	171,194	141,150	528,544	107,102	$114,138	83,294
CS	(83,520)	806,218	84,945	11,097	887,317	425,576	2,131,633	342,056	$316,959	489,259
ECE	(60,222)	778,751	81,348	31,763	741,626	575,841	2,149,107	515,619	$303,537	475,214
FPE	0	187,961	23,137	36,136	374,055	158,570	779,859	158,570	$86,332	101,629
H&A	0	1,054	0	0	357	736	2,147	736	$0	1,054
IGSD	0	53,495	14,318	0	60,216	19,353	147,382	19,353	$53,425	70
MGT	(14,216)	167,825	34,080	0	99,310	105,348	392,347	91,132	$127,164	40,661
MS	(6,953)	253,423	50,613	10,390	456,179	183,109	946,761	176,156	$188,854	64,569
ME	(40,006)	773,072	138,683	102,729	480,121	534,256	1,988,855	494,250	$517,474	255,598
PH	0	48,528	3,357	523	26,283	28,457	107,148	28,457	$12,526	36,002
SSPS	0	384,202	74,859	3,912	140,684	261,731	865,389	261,731	$279,325	104,877
Other	10,500	138,678	12,633	0	243,949	22,517	428,277	33,017	$47,138	91,540
Totals	$(386,909)	$5,453,128	$805,839	$606,415	$4,983,454	$3,655,438	$15,117,368	$3,268,529	$3,006,862	$2,446,266

Table C.5: Summary of Sponsored Program Expenditure Activity FY2010 and FY2009 (Office of Sponsored Programs, Winter 2010-2011)

Worcester Polytechnic Institute
Comparative Summary of Sponsored Program Expenditure Activity
FY2010 and FY2009

Element of Cost	FY2010 Expenses	FY2009 Expenses	% Change
Salaries & Wages	$5,453,129	$4,600,775	18.5%
Fringe Benefits	805,839	725,310	11.1%
Equipment	606,415	470,890	28.8%
Other Direct Expenses	4,983,455	4,214,817	18.2%
Subtotal Direct Program Costs	$11,848,838	$10,011,792	18.3%
Indirect Costs	3,655,439	3,163,717	15.5%
Total Program Costs	$15,504,277	$13,175,509	17.7%
Less: WPI Cost Sharing[1]	(386,908)	(749,151)	-48.4%
Total Sponsored Program Costs	$15,117,369	$12,426,358	21.7%

[1]Due to the method used for recording expenditures, a breakdown of WPI cost sharing to net against direct sponsored program costs by category is not possible without further analysis.

Table C.6: Historical Summary of Sponsored Program Activity (Office of Sponsored Programs, Winter 2010-2011)

Worcester Polytechnic Institute
Ten-Year Historical Summary of Sponsored Program Activity (Including Congressional Funding)
FY2001 (Base Year) to FY2010

	Proposal Volume				Award Volume				Expenditure Volume[1]		
Fiscal Year	No.	Amount	% Change from Prior Yr.	% Change from Base Yr.	No.	Amount	% Change from Prior Yr.	% Change from Base Yr.	Amount	% Change from Prior Yr.	% Change from Base Year
Base 2001	234	63,662,517			118	8,401,327			7,091,737		
2002	202	60,428,924	-5.1%	-5.1%	93	7,834,171	-6.8%	-6.8%	8,549,516	20.6%	20.6%
2003	228	73,472,235	21.6%	15.4%	128	10,904,309	39.2%	29.8%	9,265,725	8.4%	30.7%
2004	207	72,503,900	-1.3%	13.9%	122	13,593,899	24.7%	61.8%	11,740,812	26.7%	65.6%
2005	209	82,590,969	13.9%	29.7%	111	11,488,805	-15.5%	36.7%	11,965,468	1.9%	68.7%
2006	219	69,308,920	-16.1%	8.9%	122	16,654,758	45.0%	98.2%	12,645,331	5.7%	78.3%
2007	217	53,058,847	-23.4%	-16.7%	120	11,436,003	-31.3%	36.1%	11,736,587	-7.2%	65.5%
2008	274	91,400,387	72.3%	43.6%	126	14,631,997	27.9%	74.2%	12,129,731	3.3%	71.0%
2009	312	126,584,577	38.5%	98.8%	139	13,706,844	-6.3%	63.2%	12,426,357	2.4%	75.2%
2010	344	185,350,701	46.4%	191.1%	152	17,374,461	26.8%	106.8%	15,117,369	21.7%	113.2%

[1]Source: Sponsored Programs and Research Accounting files

Table C.7: List of Prime Sponsors (Office of Sponsored Programs, Winter 2010-2011)

CIHR	Canadian Institutes of Health Research
CommMA	Commonwealth of Massachusetts
DARPA	Defense Advanced Research Projects Agency
DED	Department of Education
DHHS	Department of Health & Human Services
DHS	Department of Homeland Security
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
EPA	Environmental Protection Agency
NAS	National Academies of Science
NASA	National Aeronautics & Space Administration
NIH	National Institutes of Health
NIST	National Institute of Standards and Technology
NSA	National Security Agency
NSF	National Science Foundation
USDA	Department of Agriculture
VA	US Department of Veterans Affairs

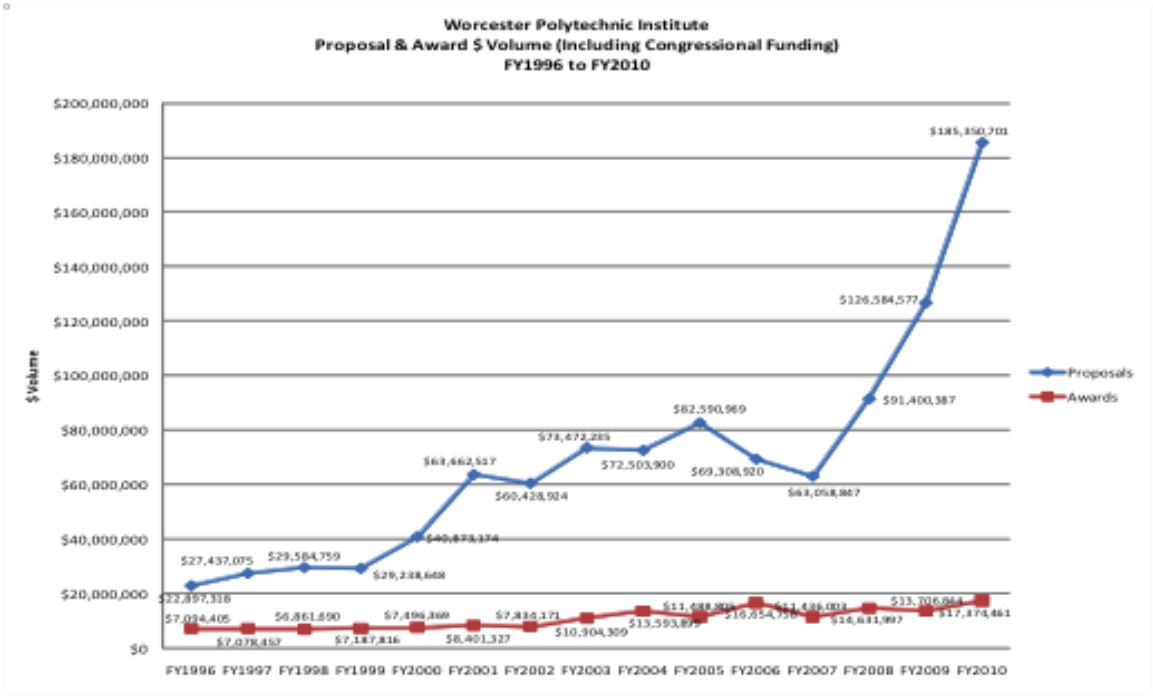

Figure C.1: Proposal & Award $ Volume FY1996 to FY2010 (Office of Sponsored Programs, Winter 2010-2011)

Appendix D – The Office of Development and Alumni Relations

Table D.1: Donors and Their Commitments to WPI (WPI, Office of Development and Alumni Relations, 2011)

Commitment	Donor Count	Primary Donor Category
$ 6,820,561	582	Corporation
$ 7,215	3	Educational Institutiion
$ 12,584,703	51	Estate of Alumna/us
$ 2,630,625	11	Estate of Friend
$ 177,528	224	Faculty/Staff
$ 17,912,906	37	Family Foundation
$ 11,687,804	31	Foundation
$ 3,941,117	885	Friend
$ 348,135	664	Graduate Alumnus
$ 3,245	8	Grandparent
$ 16,450	8	Honorary Degree Recipient
$ 95,218	220	Mass Academy Parent
$ 132,272	89	Non-degreed Alumna/us
$ 410,363	39	Other Organizations
$ 540,765	1490	Parent
$ 700	2	Religious Organization
$ 35,498	91	Student
$ 3,664,846	15	Trustee
$ 725	8	WPI Certificate Recipients
$ 2,879,035	42	Widow/er
$ 36,183,361	6654	Alumna/us
$ 2,936,753	28	Charitable Organization
$ 103,009,825	11182	Total

Table D.2: Donor Commitment by Giving Level (WPI, Office of Development and Alumni Relations, 2011)

Giving Level	Alumni	Corporations	Current Trustees	Emeriti Trustees	Family Foundations	Foundations	Non-Alumni	Other Organizations	Total Commitment
$10,000,000 to $14,999,999	-	-	-	-	12,921,701	-	-	-	12,921,701
$5,000,000 to $9,999,999	6,185,100	-	-	-	-	6,000,000	-	-	12,185,100
$3,000,000 to $4,999,999	7,635,000	-	-	-	-	-	3,000,500	-	10,635,500
$1,000,000 to $2,999,999	7,594,322	-	3,154,730	2,069,821	3,950,000	2,320,340	4,461,014	2,005,000	25,555,227
$500,000 to $999,999	3,930,813	535,169	2,278,802	-	500,000	1,772,794	530,487	-	9,548,065
$250,000 to $499,999	4,616,462	2,141,364	705,300	265,335	40,798	571,440	1,168,811	667,750	10,136,461
$100,000 to $249,999	3,211,830	1,615,274	970,755	464,389	193,065	768,910	548,626	310,732	8,083,581
$50,000 to $99,999	2,218,666	919,683	127,150	359,632	130,000	56,765	413,241	84,750	4,309,888
Less than $50,000	5,644,510	1,609,071	135,380	259,558	218,140	197,555	1,291,204	278,883	9,634,301
Total	$ 41,036,704	$ 6,820,561	$ 7,372,116	$ 3,418,735	$ 17,953,704	$ 11,687,804	$ 11,413,883	$ 3,347,116	$ 103,009,825

Note:

Alumni category includes primary donor categories of: ALUM, ALND, ESTA and GRAD, except Alumni Current and Emeritus Trustees.

Non-Alumni category includes all individuals who are not WPI Alumni, except non-Alumni Current and Emeritus Trustees

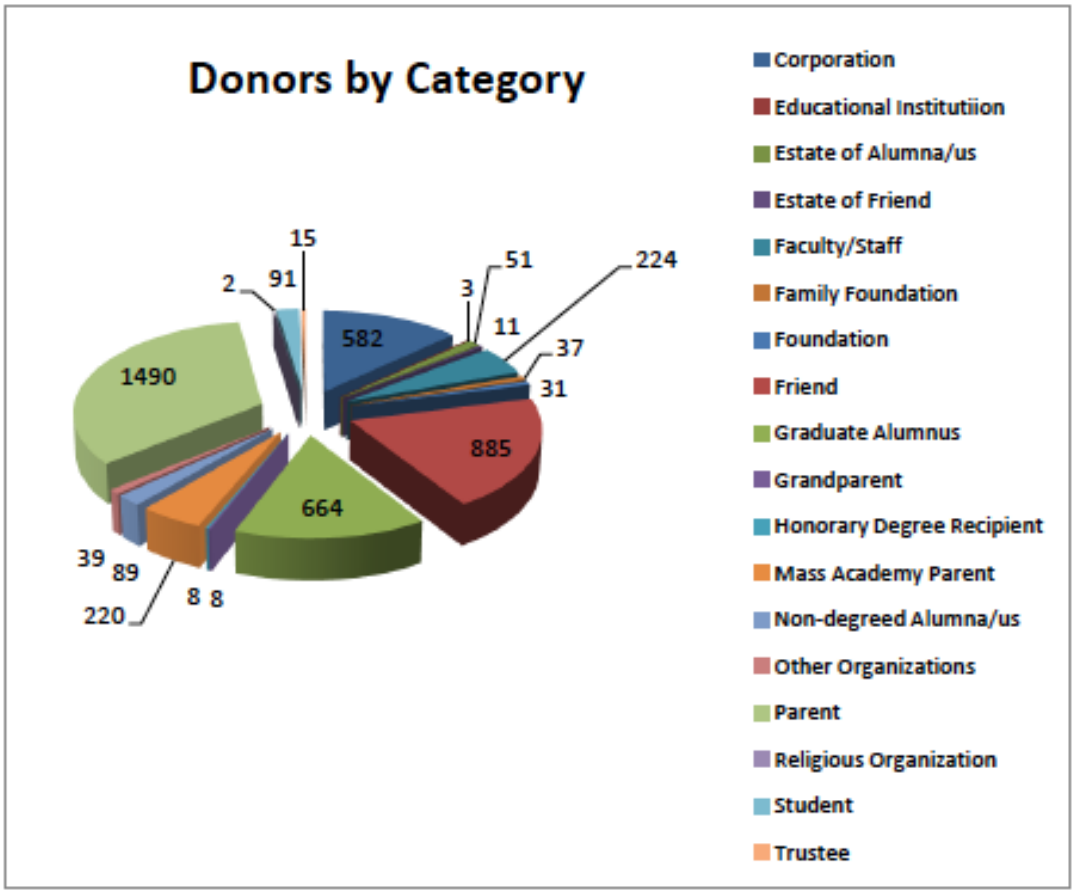

Figure D.1: Donors by Category (WPI, Office of Development and Alumni Relations, 2011)

Appendix E – Faculty Research Survey

Question 1

Through which departments do you conduct your research?

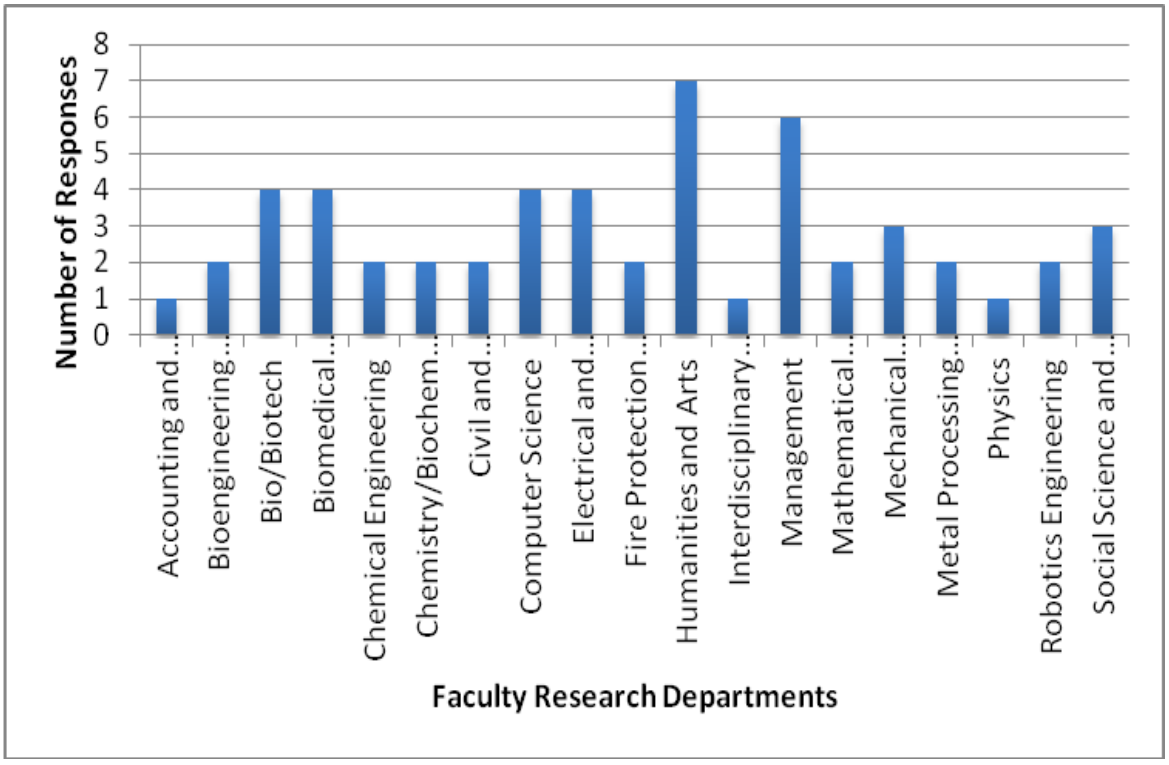

Figure E.1 Faculty Research Departments

Question 2

What are your current Primary research interests?

- Organizational change, power in organizations, and social entrepreneurship.
- Drinking water quality; water treatment; disease transmission and risk analysis for water sources.
- Axiomatic design applied to process improvement in companies and education.
- 19th-century literature, philosophy, culture, art.
- Educational scholarship in engineering.
- Computational fluids; biolocomotion; mathematical biology.
- Materials processing.
- Entrepreneurship Family Business
- Artemisinin antimalarial drug delivery by plant ingestion. Artemisia annua artemisinin and flavonoid biosynthesis. Bioreactor development for automation of plant micropropagation. Algal biofuel studies.
- Catalysis, green processes, green chemistry, sustainable energy and energy carriers.
- Science Education and also crayfish genetics and behavior.
- Digital Humanities, Computer Games, Technical and Scientific Communication.

- Globalizing engineering education, project-based learning.
- Regenerative medicine.
- Atomic Physics
- Societal dynamics of technology social and human issues triggered by biotech and micro-cellular research.
- Medical ultrasound; ultrasound simulation; telemedicine.
- Political reform in China; national identity in China and in Taiwan; Taiwan history; China history.
- Editor-in-Chief of “The Writings of James Fenimore Cooper”
- Computer networking and security.
- Modeling catalysts.
- Health information technology, mobile health, smart health through technology innovation.
- Surface-based methods to purify chiral pharmaceutical drugs. Development of porous solids as adsorbent materials for environmental remediation of hydrocarbon contaminants, and for drug delivery.
- Biomedical signal processing.
- Cybersecurity, computer-science education.
- -Intelligent ground vehicles, human in the loop cyber physical systems, robot control.
- Wildland Fires.
- Public safety; green building design; public perceptions of risk.
- Adult and embryonic stem cells soft tissue regeneration biomaterial scaffolds tissue engineering.
- Robotics, computer vision, image processing.
- Manufacturing.
- Human computer interaction, language processing, artificial intelligence.
- Space Policy, Science Education, cognitive styles.
- Power systems network operation and control.
- Analog and Mixed Signal Integrated Circuit Design.
- Stormwater management sustainable development food systems planning.
- Decision making, perspective taking, culture, stereotyping, stigmas.
- Biomechanics.

Question 3

From which agencies have you received federal funding in the past?

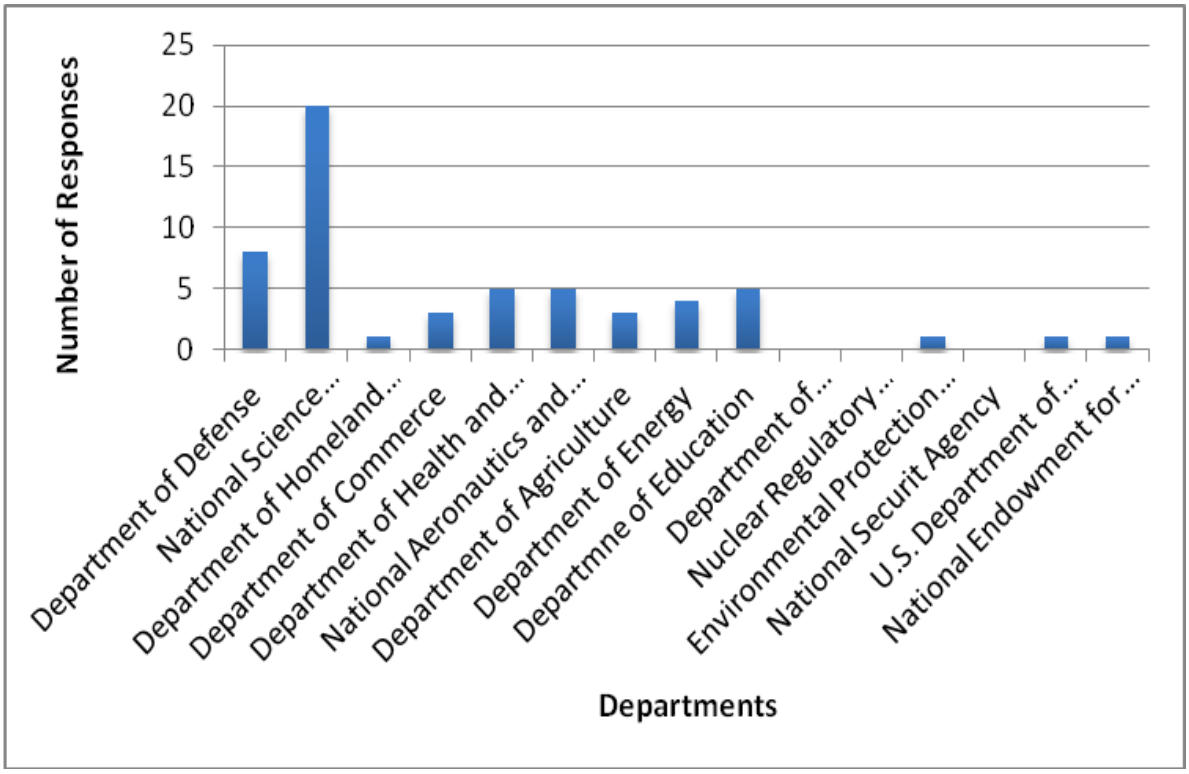

Figure E.2 Past Federal Funding Agencies

Other (please specify):

- NIH
- DOD: Specifically, Army Research Office
- None but applied to NSF and JFSP (DOL)
- American Chemical Society, American Heart Association
- National Endowment for the Humanities
- Davis educational foundation
- Customs Service: Small Business Administration
- National Endowment for the Humanities (NEH)

Question 4

What future projects do you plan to propose?

- Many
- Cross cultural differences in the transmission of attitudes
- Analog to Digital Converters Low Jitter Clock Generation
- No plans
- The Educational Case for a Simulated Lunar Base on Earth- Circa 2069, PROFAC as a means of on orbit refueling without lifting LOX from Earth, follow up of 1000

undergraduate and Graduate students in Chemistry, Physics, Economics and Sociology who were in college in 19850 how did their careers progress- by Cognitive style?

- Human robot interaction for robots with sophisticated hands (joint with other faculty at WPI)
- Wind energy system
- Robotics education, robotic devices
- Restoration of functional skeletal muscle for volumetric muscle loss manipulation of cell phenotype using culture conditions
- I plan to apply to USDA, NIST (DoC) and maybe NASA
- Physical Human Robot Interaction Informal Robotics Education
- Not sure, but perhaps something in Security education
- Unsure. More collaborative work, likely.
- Development of porous solid as heterogeneous catalysts
- More health project to NIH, AHRQ, NSF – patient facing technologies to bring healthcare services to homes, increase health awareness and understanding through mobile devices.
- None
- Urban history of Taipei; collaborative research model for US scientists incorporating China language and culture training into prep
- Optimal methods for chronic disease management
- Gyroscopes
- Not sure at this point
- A Fulbright K-12 Education Initiative with China and Japan
- Use of technology in teaching in the undergraduate science laboratory
- Phase I clinical trials of Artemisia whole plant delivery Economical development of edible Artemisia for and in developing countries (Africa in particular) Agricultural trials in the US Northeast for Artemisia crop rotation to control weeds, and to obtain high value herbal crop. Role of light quality in controlling algal growth and oil production.
- Entrepreneurship
- More materials processing
- A film script, a book proposal
- A study of learning in remote, virtual, and hands-on laboratory contexts.
- Not sure
- Uncertain

Question 5

Of the following, which methods do you use the most to determine which federal agency to send proposals to?

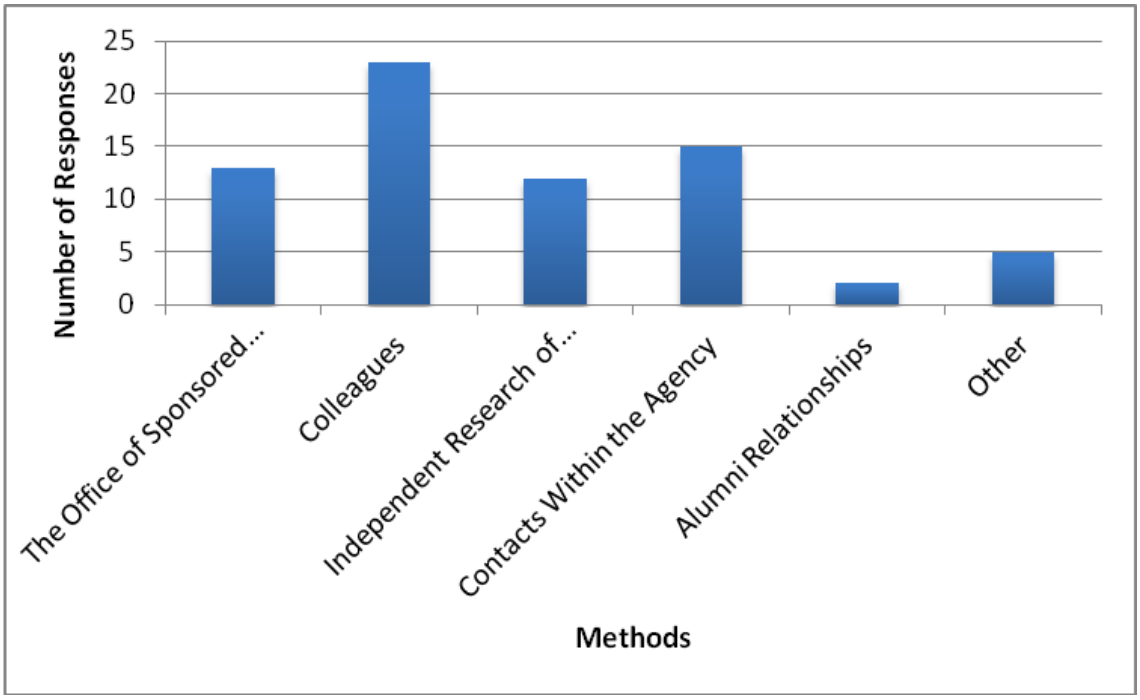

Figure E.3 Methods to Determine Federal Funding

Other (please specify):

- RFP that read me.
- Announcements from the agency
- National agency search
- Mailing lists, web searches
- Going to meetings and seeing who was funded for what

Question 6

How would you rate WPI's success as a whole in receiving federal funding?

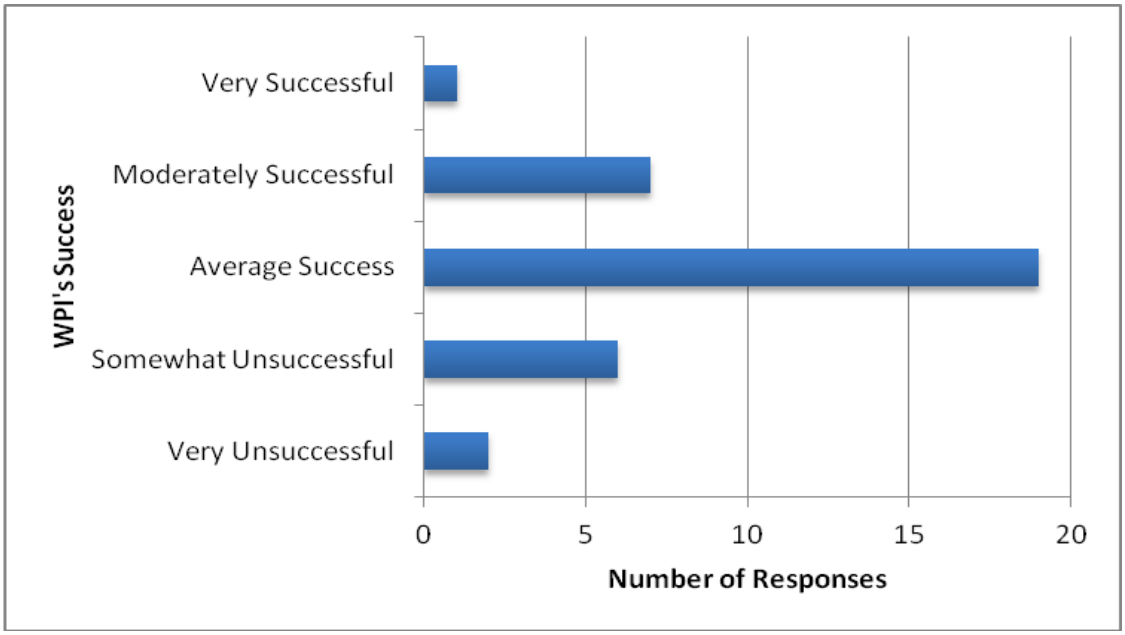

Figure E.4 WPI's Success

Question 7

What agencies do you believe provide the greatest opportunity for increased funding to WPI?

- NIH, DOD
- It is unclear for the social sciences. We are a small and diverse department.
- No idea – federal government seems to be decreasing funding in the current political/economic climate
- No general answer because agendas vary widely between agencies, as do research plans among investigators
- I don't know
- Department of Energy
- DoD, NIH, NSF
- Defense science office individual focus agencies such as American heart association perhaps NSF or NIH
- For us, dept. of the interior
- USDA, DHS
- NSF, DoEducation, DoD
- National Institutes of Health, They have MUCH more available funding than the National Science Foundation.
- NSF, DOE, DOD
- NSF, NIH
- NSF, DARPA, NIH
- NA
- NSF; Dept of Education; NEA; NEH; NIH; DOD
- No idea
- NIH, Foundations, Commercial/Industry Associations (insurance groups, consulting groups requiring research)
- ABC

- NIH and DoD
- Foundations.
- Independent foundations
- NEH-We currently underutilize them Fulbright
- NSF, DOE, DOD
- NIH, USDA, NSF, DOD
- NSF, NIH
- DOEnergy
- Not sure. Maybe there are private foundations we haven't looked at in any detail.
- Not sure given the cutbacks that the federal budget faces in the near future
- NSF

Question 8

If a WPI oriented database of agency agendas was established, would you use it?

Yes = 27 (77.1%)
No = 8 (22.9%)

If yes, what information would you like to see in said database? If No, why not?

- Funding opportunities for social science
- Relate to WPI faculty research interests. Searchable with multiple keywords have contacts at agencies and WPI people who have had success.
- Would use it if info were useful and up-to-date. But "useful" probably requires a sophisticated analysis of research agendas within each relevant division of each agency. That's a tall order.
- Most of the fields at WPI are very different from mine.
- Current funding programs
- Early information of a research grant is very important to prepare, organize a team, and communicate with the sponsor.
- Funding rates and funding trends
- Possibly. It would need to include information not found elsewhere (more comprehensive) or significantly easier to use. If it simply replicates information, I'm more likely to go to grants.gov or the individual agency for the first-had information.
- Most of this material is already available and everyone has access to these so there no market advantage in producing another one
- WPI supports sciences and engineering well. I would like a database of opportunities for other programs.
- Information about agencies that sponsor educational research and in what areas
- The problem is that most of WPI's programs center on engineering; working in science, different agencies and programs are appropriate.
- Maybe use it- would depend on how useful I found it once constructed. Not sure what new information would be available. Plus it has to constantly change as agency directives change.
- Entrepreneurship; Economic Development
- RFPs
- Proposal success rates; areas of research receiving funding
- Mission of the agency, types of grants, a roadmap to funding possibilities, key contact information.

Question 9

Do you see opportunities in expanding your research to involve global project centers in some way?

Yes = 19 (54.3%)
No = 16 (45.7%)

If yes, please specify:

- Start with MQPs then expand
- I already use the global project centers to conduct cross-cultural research.
- My research (and consulting) informs my advising of IQPs at global centers, but trying to incorporate publishable applied mathematics into an undergraduate UQP would be a potentially harmful diversion.
- Comparative research opportunities abound.
- I'm not sure what global project centers refers to. I collaborate with researchers outside the US.
- International collaboration is a trend of teamwork in future research. It will greatly expand our capability of involving and doing projects.
- Australia, Melbourne because of CSIRO.
- Not at this time.
- China IQP site
- What does "opportunity" mean here? The project centers seem to be reproducing static (already developed) projects for local audiences. These are useful for their purpose but the project centers seem "siloed" and unwilling to partner in extensive ways
- Caution: I'm not sure global project centers and faculty research are a good match in most cases.
- Via the China Initiative on campus
- MAYBE – depends on the center and where they are located.
- Not really sure yet, but WPI should examine ways to connect the GPP with graduate education/research
- Possibly, if I can figure out a way to train undergraduate students to collect data in a rigorous way

Question 10

We would appreciate any comments regarding our project or about funded research at WPI.

- We should add more research professors, not pressure existing faculty to skew research-teaching balance more towards teaching
- Your project is a great idea. The greatest impediment to securing externally funded research at WPI is that the amount of time faculty can spend on their research programs compared to their teaching and service load is small compared to those at competing institutions.
- Good job, I will be looking for your results.

- Your project seems targeted at people who don't know how to identify funding sources. I don't think that's the problem behind WPI not having more funding (our vision and reputation in research areas seem like bigger issues). No offense, but it isn't really clear to me what problems your project is solving.
- Good luck to you! With regard to funded research at WPI, if you want more funded research, hire more people to A) Process grant application (especially for Frank Lemire's Office), B) to work with faculty in crafting proposals, and C) To encourage the process. The infrastructure now is very thin in my opinion but expectations for funded research keep rising!

Appendix F – SWANS User Manual

SWANS

User Manual

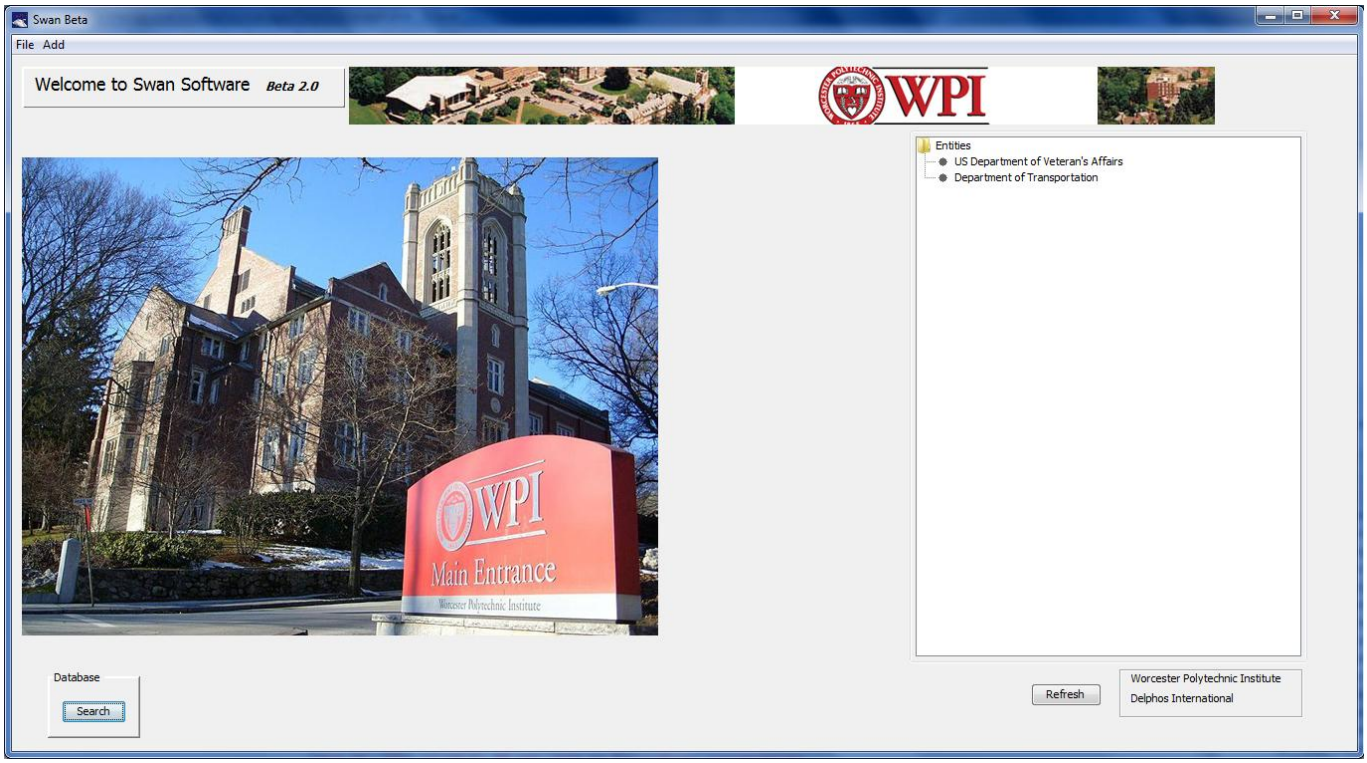

Table of Contents

1. Start up and homescreen

Upon starting the application, the following loading screen will be displayed while the user waits.

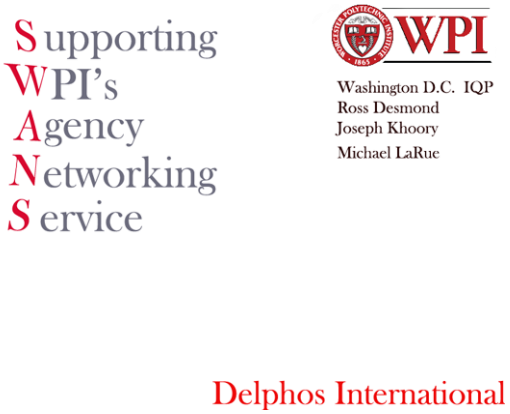

Figure F.1: Loading Screen

This screen will disappear when the application is fully loaded. Once the application itself has loaded, the tree will load on a separate thread. Giving the user the ability to start using the application while the tree is loading. This application requires the use of the internet.

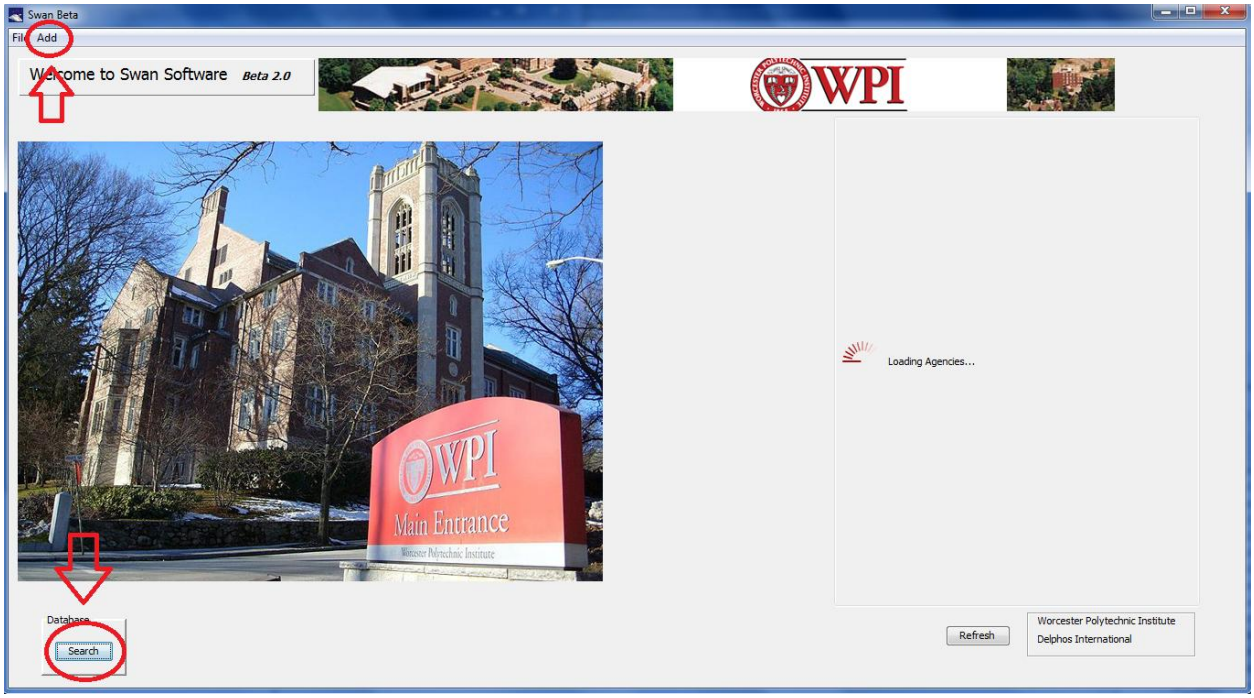

Figure F.2: SWANS Beta Start-up Screen

When the agency tree is loading, the user has the ability to search the database or add to the database. Simply click on the "Search" button on the bottom left hand corner, or the "Add" button in the file menu, circled in Figure F.1.

2. Tree Functionality

Once the Agency Tree loads, a number of agencies will be shown on the right hand side of the screen. In Figure F.3, four agencies are displayed upon start up. The number of agencies will depend on the agencies added in the database.

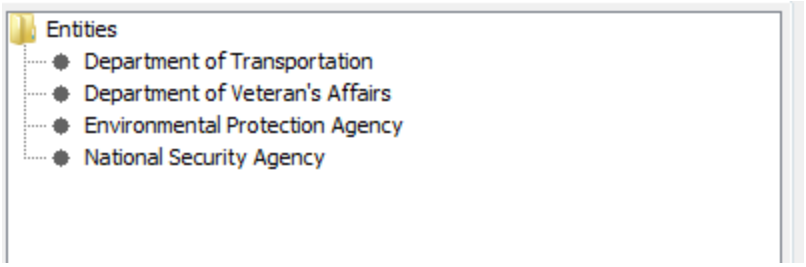

Figure F.3: Agency Tree, unpopulated

By clicking on one of the agencies, the tree will load all the departments of the agency and display them for the user to see. This feature is called Lazy Loading; it saves processing time on the initial start of the program and allows for the application to respond quickly. An expanded tree is shown in Figure F.4, displaying all the children under the Department of Transportation.

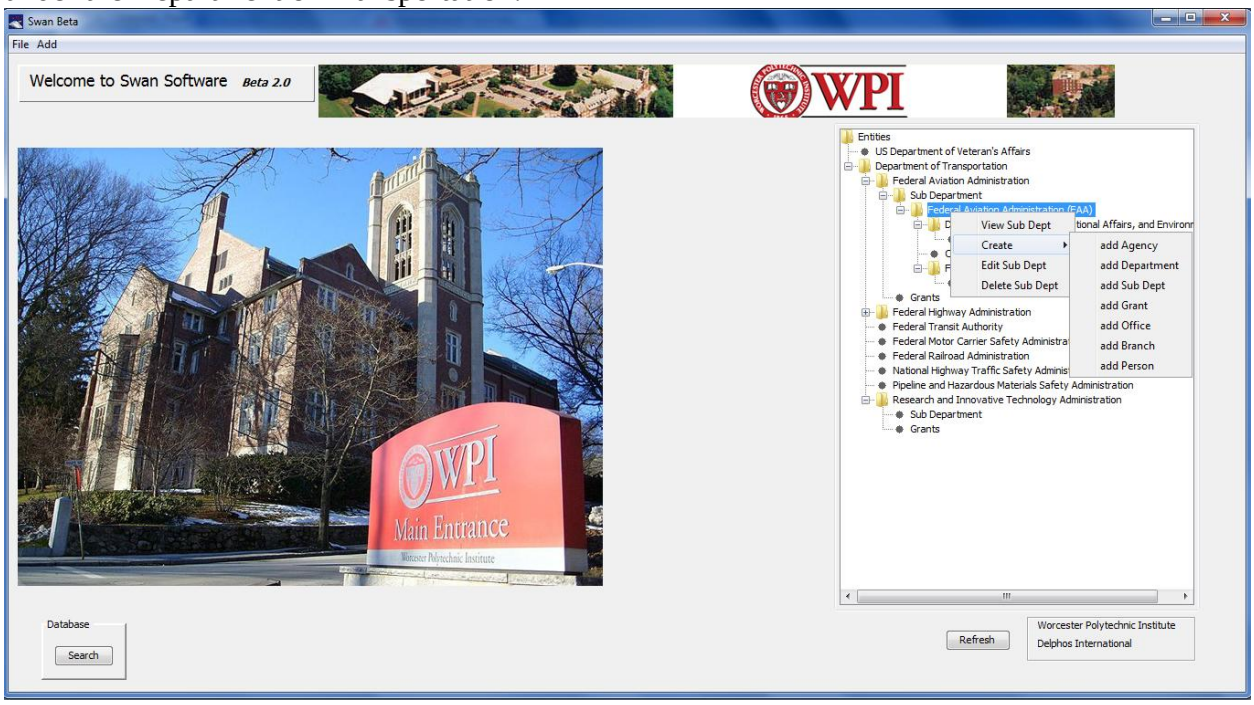

Figure F.4: SWANS Expanded Tree and Right Click Functionality.

Figure F.4 also displays the software's right click capabilities. Upon right clicking on the tree a small menu will popup displaying four options: view, create, edit, and delete. If the user scrolls the mouse over the Create button, another menu will be displayed prompting the type of entity to add to the database. This right click capability places all the necessary controls in an easy to use and understandable format in order to reduce confusion as to where buttons are located in the software. For convenience, there is an "Add" button near the file menu in the top left corner, and key shortcuts; such as Ctrl-A to add an agency.

3. Adding and Editing

3.1 Adding an Agency

In order to add to the database, a user can either use the "Add" menu button on the top left of the screen, use the keys Ctrl-A for agency, or utilize the right click in the agency tree as shown in Figure F.5.

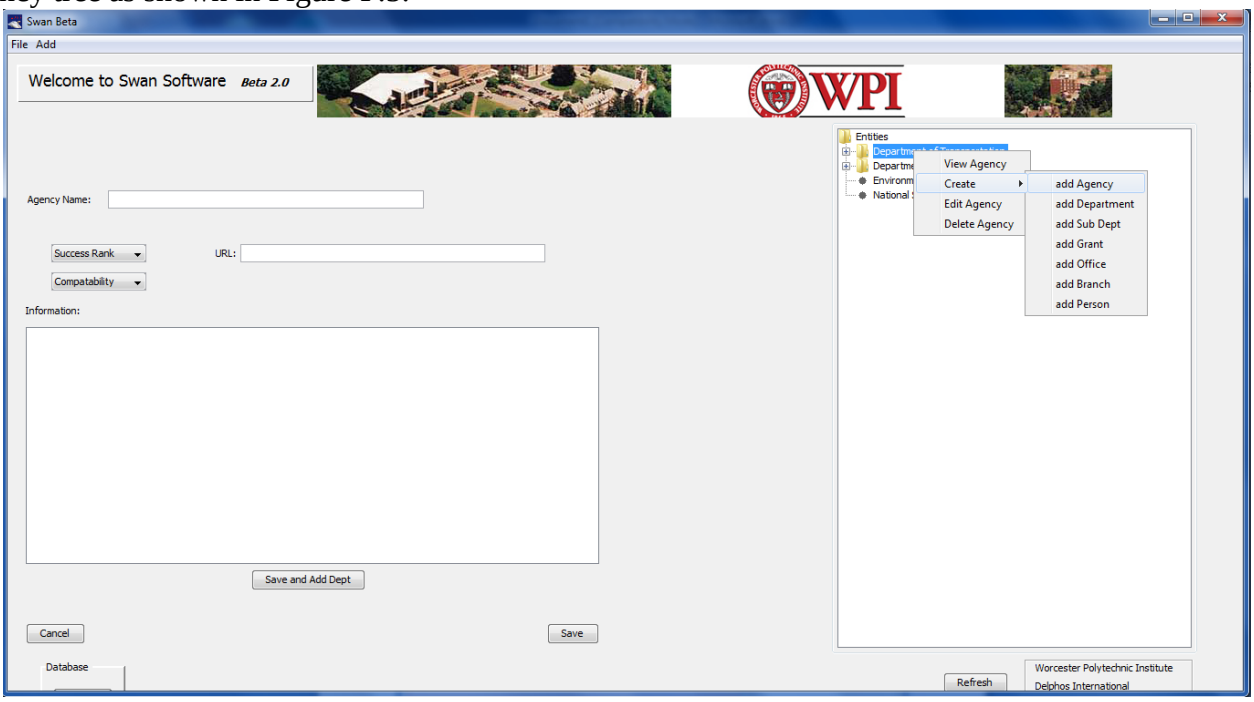

Figure F.5: Add agency via right click in tree

For an agency, the user can enter an Agency Name, a URL to their active website, information gathered from that Agency, and their success and compatibility ranking. If an Agency Name is not entered, the agency will not be saved and a small popup will prompt the user to enter a name. When the user is completed, click the save button to add it to the database and return to the home screen. The cancel button will delete all work done on this page and return to the home screen.

3.2 Adding a Department

When adding a department to the database an agency needs to be selected in the tree as shown in Figure F.6.

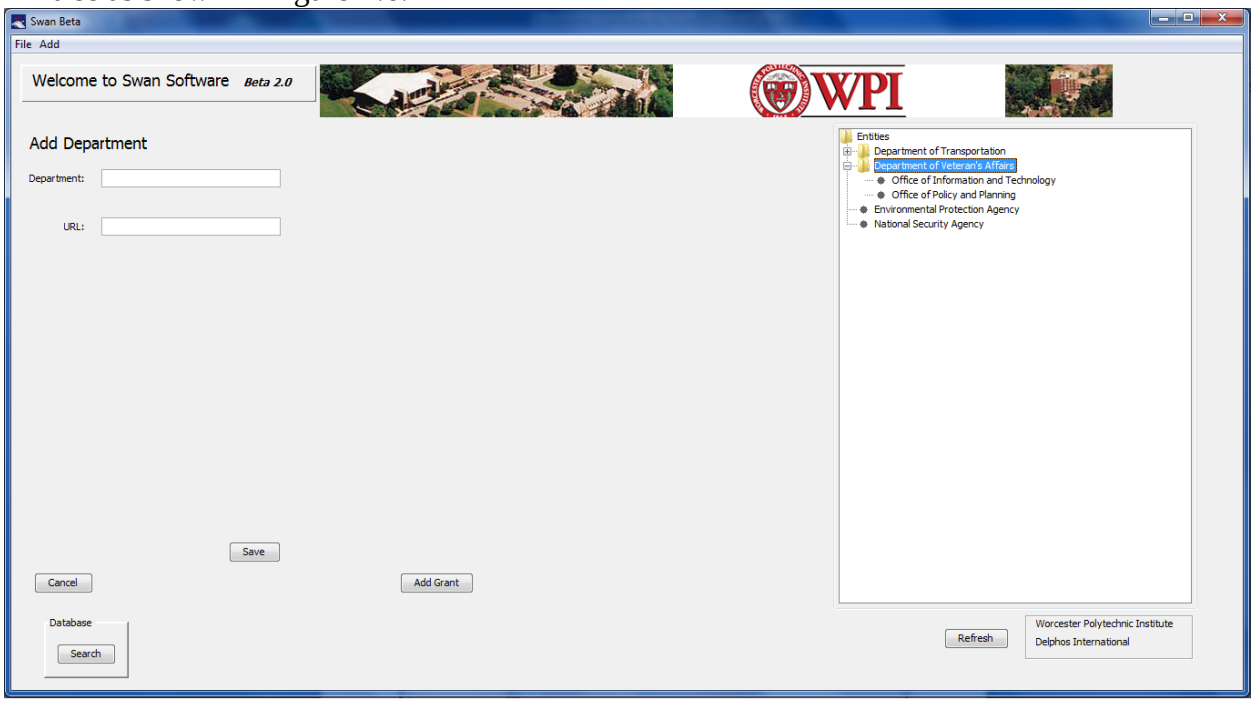

Figure F.6: Adding a department to the database

A department only takes a department name and a URL for it is used as a parent and a node within the Agency to contain many sup departments. Once the user has selected an agency and added a department name, the user can click the save button to save the new department to the database, or select "Add Grant" which will save this department and bring the used to the Add Grant panel.

3.3 Adding a Grant

After clicking “Add Grant” from the tree or the file menu the following Add Grant page will be displayed, Figure F.7.

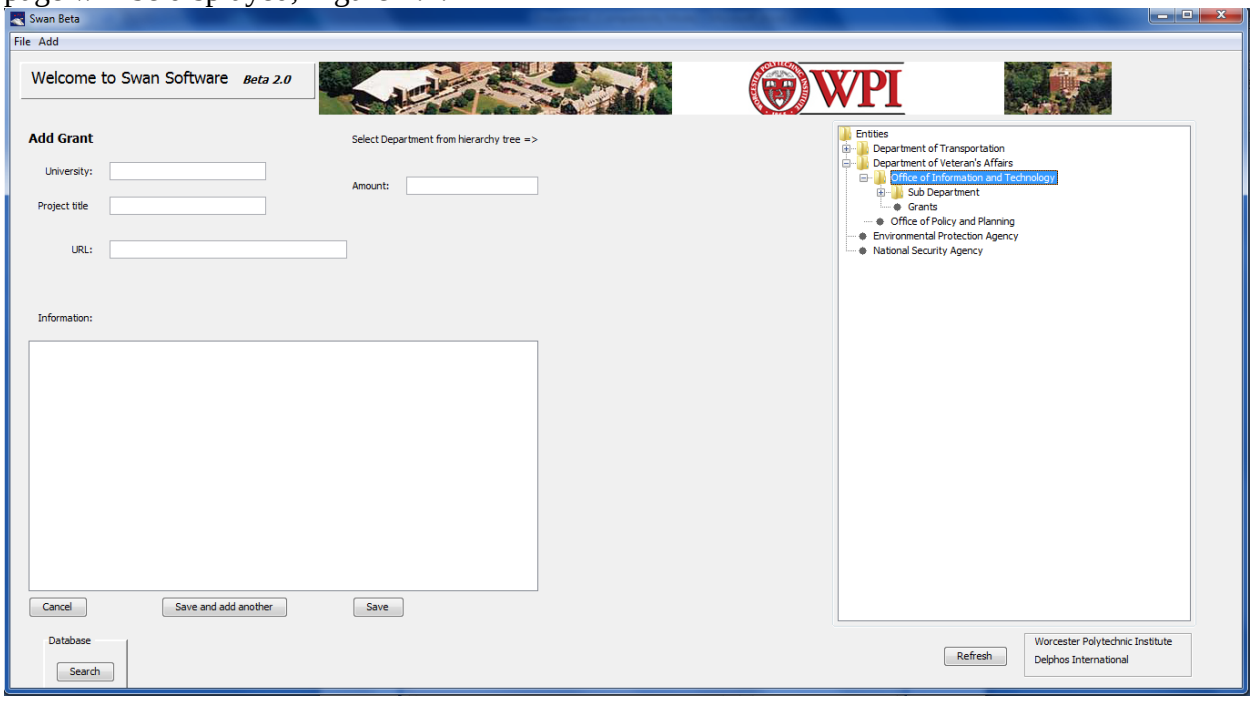

Figure F.7: Adding a Grant

A grant has the Universities Name, the amount given, the project title, URL (if it exists), and any information on the grant, such as dates or project description. The user must specify which department this grant came from; to do this the user should select a department from the tree before saving. Otherwise the grant will not be saved and a popup will prompt the user to select a department. The required information is the amount, university, and title; after entering this information click the save button to store the new grant in the database.

3.4 Adding a Sub Department

After selecting the “Add Sub Department” button, the sub department panel will be shown on the left hand side of the screen as displayed in Figure F.8.

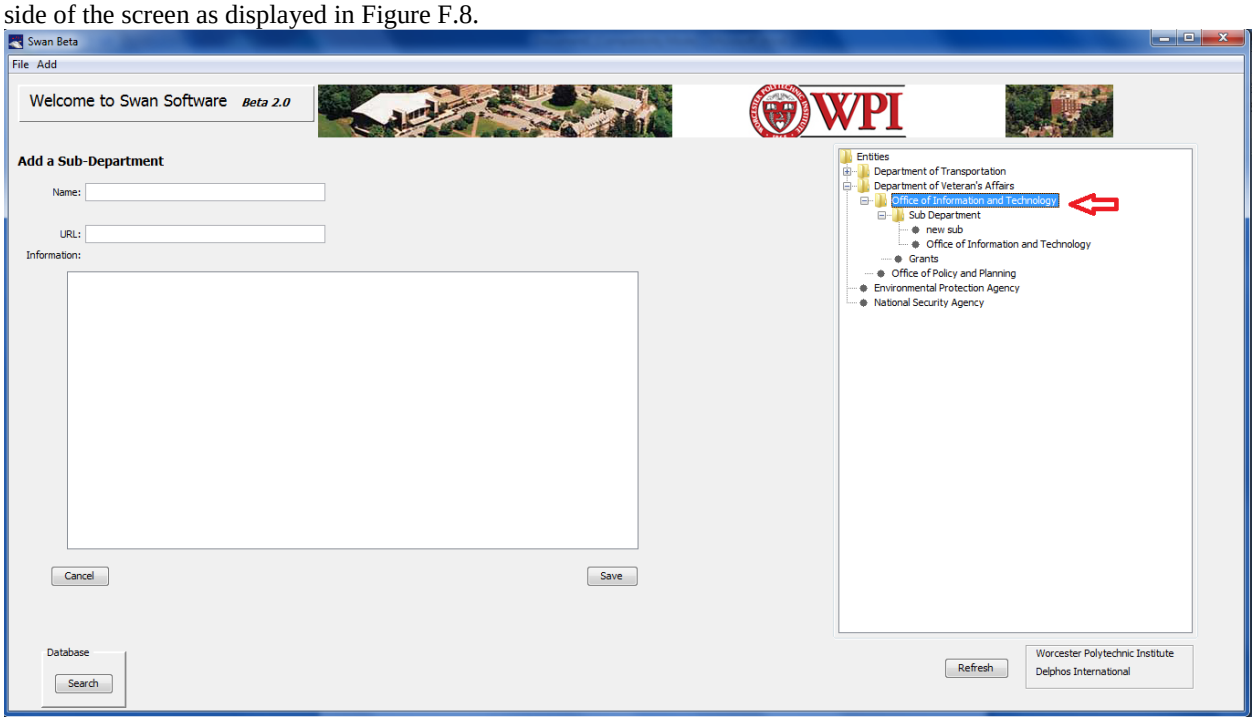

Figure F.8: Add a Sub Department

To add a sub department, fill in a name, the URL and information on the sub department and click a department in the tree. Then click the save button and the tree will refresh to include the new sub department.

3.5 Adding an Office

Once the user has brought up the "Add Office" panel you're screen should look like Figure F.9. For smaller agencies, an office may be Labeled "Office of the Administrator." This office is responsible for storing contacts (people) for these smaller agencies.

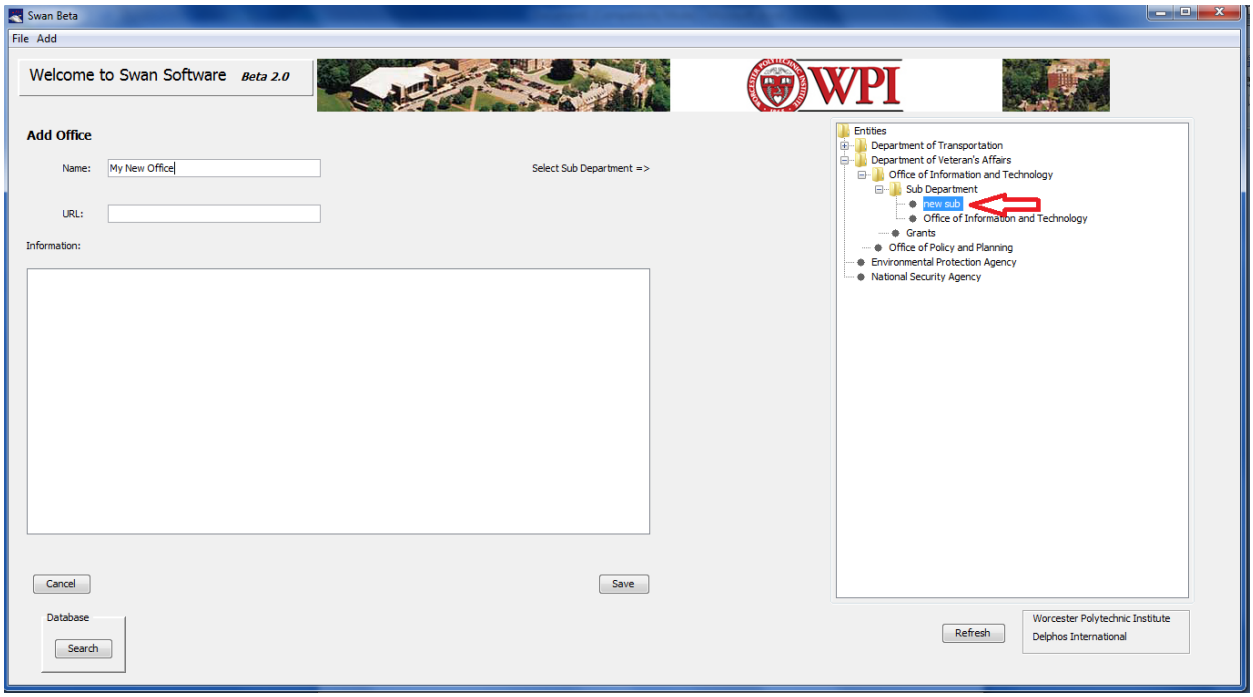

Figure F.9: Adding an Office

This panel resembles the "Add Sub Department" screen and requires the same fields. The user must select a sub department where this office is located, then click save.

3.6 Adding a Branch

For larger Agencies, a Branch may be needed to access smaller parts of that agency. When adding a Branch the office needs to be selected that contains this branch, as shown in Figure F.10.

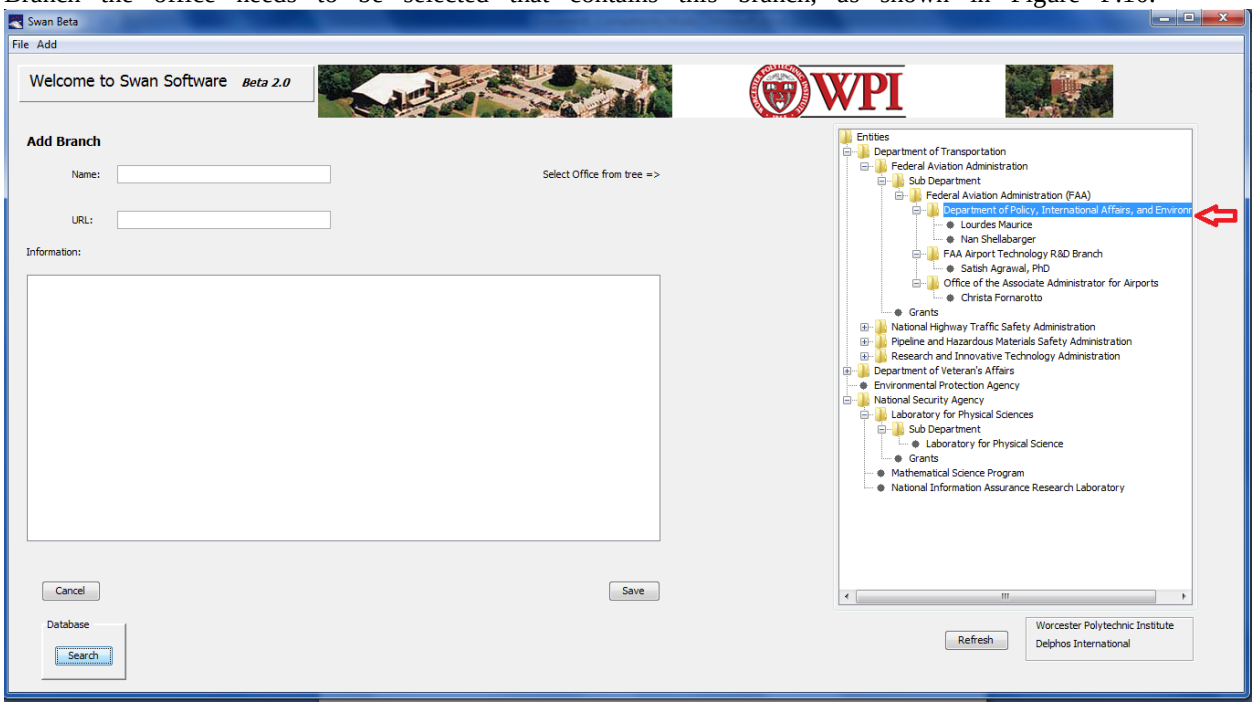

Figure F.10: Adding a Branch

The Name field is required in order to save to the database; otherwise a small popup will appear to notify the user the name field is empty.

3.7 Adding a Person

Adding a person requires the user EITHER to select an Office or a Branch from the tree. Adding a person can be viewed is different ways.

- For a smaller agency, adding a person to an office simply states them as a contact within that office, and the lowest part of the tree.
- For a large agency, adding a person to a branch states them as a contact within that branch and the lowest part of the tree.
- For a large agency, adding a person to an office that also includes branches, states them as a director in that office, or an administrator of the following branches

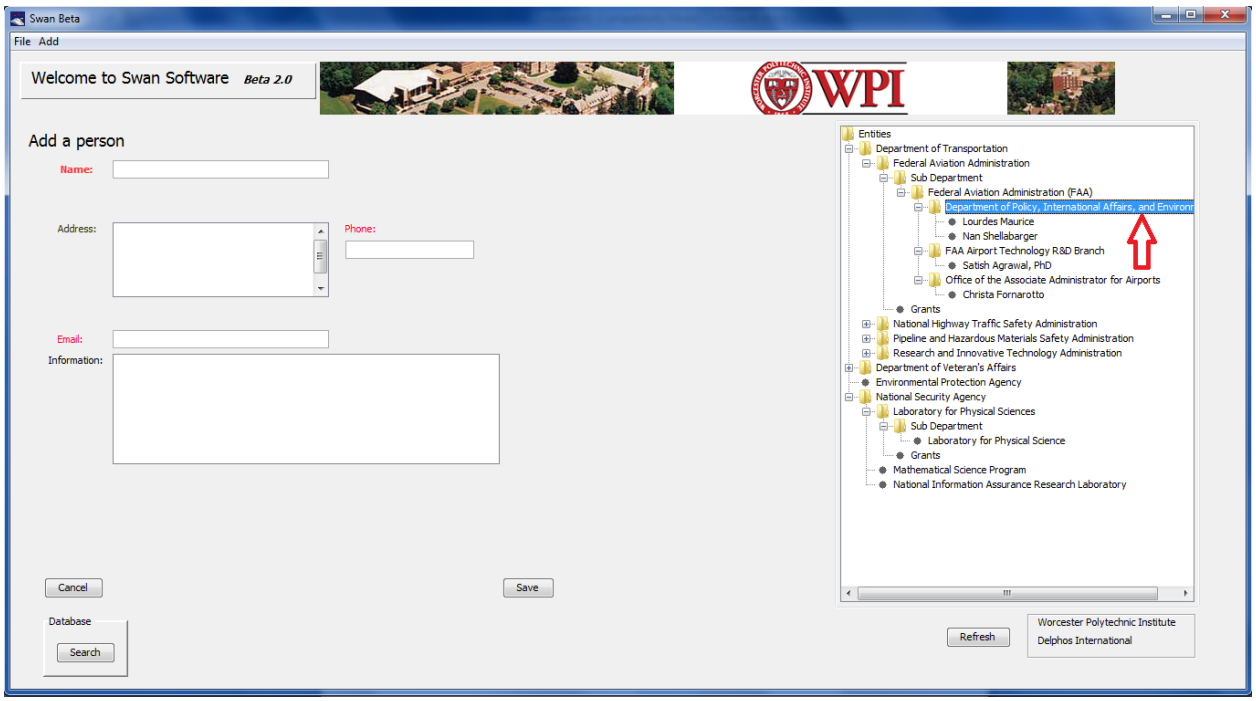

Figure F.11: Add a person to an office

A person's name is the only required field for the database; however the labels marked in red, in Figure 3.7, are highly recommended as they provide contact information for professors using Swans.

3.8 Editing All Objects

Editing is a simple process and only accessible via the right click popup in the tree, Figure F.12.

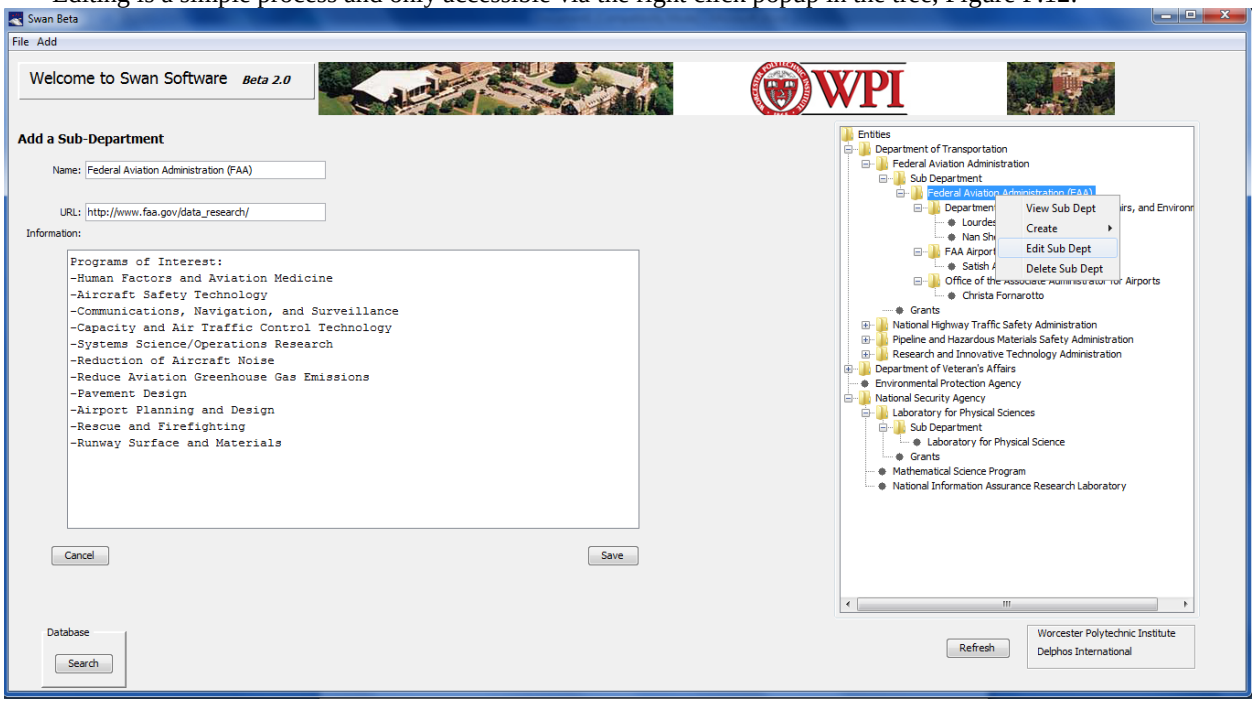

Figure F.12: Editing a sub department

After selecting a part of the tree, right click and discover the options for that entity. Click the edit button and the panel showing that respected entity will be displayed on the left hand side for editing. Click save to store any edited information to the database.

4. Searching and Viewing

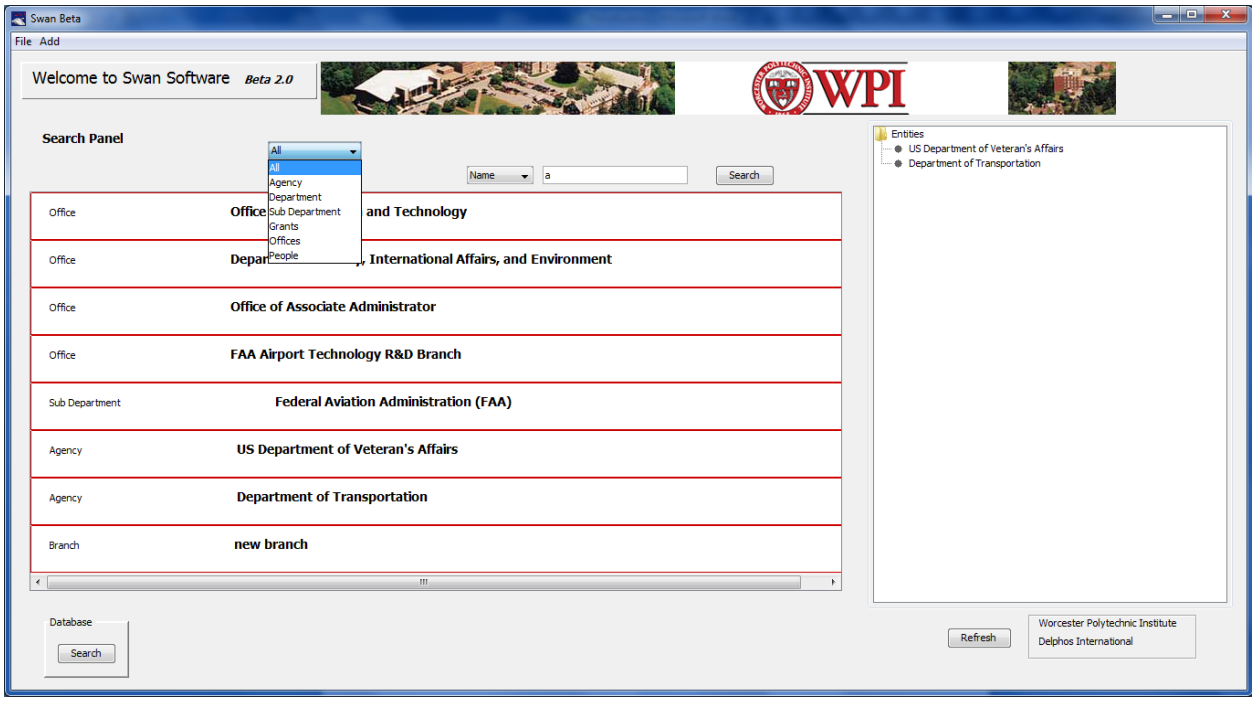

Figure F.13: Basic Search through every table in the database.

This search pane offers numerous search abilities from searching through everything in the database to searching through specific agencies for sub-departments. The combination box that is open in Figure F.12 displays all of the tables the user is able to search through individually, and is defaulted to "All" for a quick search through the entire database. This figure displays all of the results returned when a search for the letter "a" in the name field is completed. A user may specify what tables to search through and certain columns. More advanced users can search through sub departments, and by clicking on an agency the search will only return information under that agency. The returned information is displayed in a simple viewer with the title and what type of entity has been recalled. By clicking on one of these panels a larger view will be displayed for a more in depth look as shown in Figure F.13.

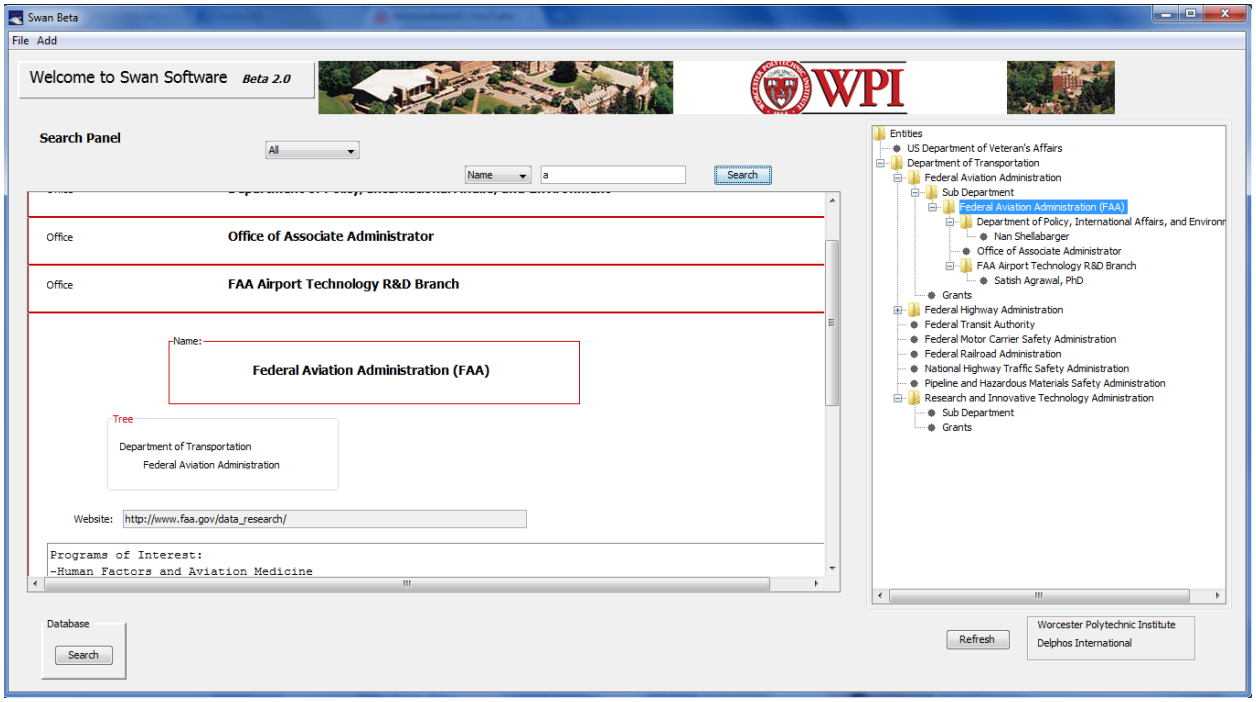

Figure F.14: Search and In-Depth Display.

After clicking one of these small viewers, a larger view is displayed where this particular entity is located in the tree and any other information stored in the database. In the case of a sub department as shown in Figure F.14 a website is displayed along with information about this particular sub department. Notice the other values returned in the search are still shown and are available for expanding into a larger view.

Appendix G – SWANS Technical Manual

SWANS is a Java Application, and as such it features Javadocs. Javadocs is a uniform commenting system that allows for developers to state the function of a program, parameters, and return values. It also allows for the developer to state the purpose of the class and site references. Once a developer fills in the required information above each function, he/she can export the Javadocs into a folder within the project. It is saved in html, and allows for developers to easily search through the classes to find out how functions work and the overall layout of the software. This manual is located within the folder "docs" inside the application. A developer may see these by synchronizing an Integrated Development Environment (IDE) with the Delphos International project on WPI's Teamforge website.

SWANS features over 6,500 lines of code and 38 classes. It was created in the Eclipse Helios IDE, using Netbeans as the primary GUI editor. SWANS utilizes many software engineering patterns such as Thread Gate, Lazy Loading, Singleton, Observer, and more. It also uses Java Database Connectivity (JDBC) to connect to the database and Active Objects to access information.

Appendix H – Embassy Brochures

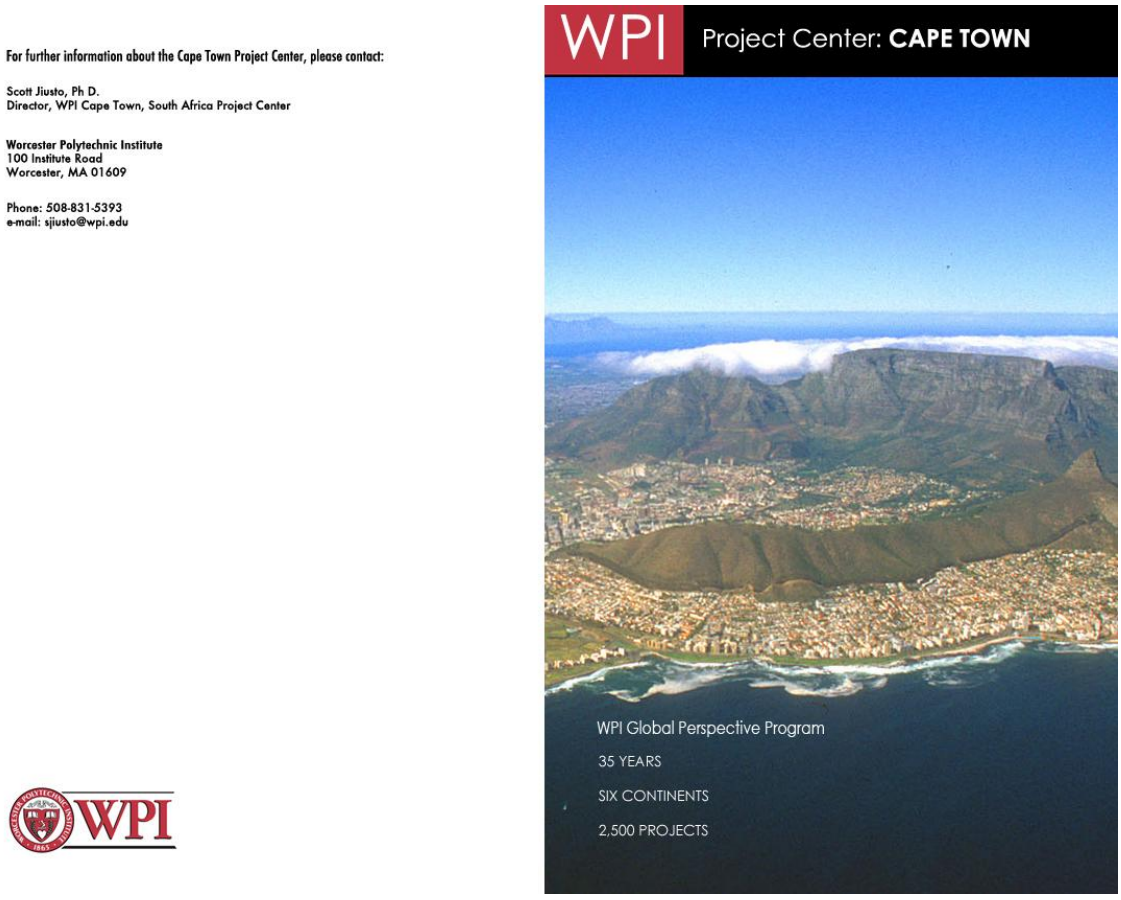

Figure H.1 Cape Town Front and Back

WPI PROJECT CENTER: **CAPE TOWN**

The WPI Global Perspective Program immerses students in communities close to home and around the world to research and implement projects, as scientists and engineers do, to solve problems and change lives.

Since 2007, in the beautiful coastal city of Cape Town, South Africa, WPI student teams have tackeled numerous community problems such as flood risk management, water and sanitation, recreational facilities for youth, sustainable housing,and economic development.

The life and work experiences have presented challeneging, real-world learning opportunities for our students - and valuable data and perspectives on pressing problems for the community.

At WPI, the opportunity to pursue projects off campus is a signature element of an academic program that prepares students to put knowledge to work by developing solutions to meaningful technical and societal problems. Through the Global Perspective Program, over 50% of all WPI students complete at least one academic project off campus, in locations from Boston to Bangkok, London to Limerick, Worcester to Windhoek and Cape Town to Copenhagen. Working in small teams in close collaboration with faculty mentors, WPI students tackle problems of importance to communities around the globe. In doing so, they make a real difference and gain the confidence to take on the challenges of work and life.

NOTABLE PROJECTS COMPLETED IN 2009
Advised by Professors Scott Jiusto & Joseph Petruccelli

Sustainable Redevelopment through Urban Planning and Mapping
Team: Owen Butler, Meghan Elwell, Ryan LeFevre, Kelsey McMenamy
Sponsor: Violence Prevention through Urban Upgrading
Liaison: Michael Krause
Report: wpi.edu/Pubs/E-project/Available/E-project-121709-075201/

Designing a Model Sanitation Center for Monwabisi Park
Team: Melanie Donahue, Blake Kelly, Katherine McKenna, Joshua Matte
Sponsor: City of Cape Town Water and Sanitation Department
Report: wpi.edu/Pubs/E-project/Available/E-project-121609-034133/

A Plan for Sustainable Economic Development within the Indlovu Project
Team: Emily Herries, Kayla Schutte, James Silvia, Jennifer Spinney
Sponsor: The Shaster Foundation
Liaison: Dianne Womersley
Report: wpi.edu/Pubs/E-project/Available/E-project-121709-045434/

Alternative Cooking Solutions For the Redevelopment of Monwabisi Park
Team: Dave Arnold, Nina Bass, Amanda Clark
Sponsor: City of Cape Town Environmental Resource Management Department
Report: http://wpi-capetown.org/projects/2009/energy/

NOTABLE PROJECTS COMPLETED IN 2010
Advised by Professors Scott Jiusto & Robert Hersh

Initiation Site Development in Khayelitsha, Cape Town
Team: Qui Chen, Matthew Connolly, Luis Quiroga, Andrew Stewart
Sponsor: City of Cape Town
Liaison: Lungelo Nokwaza
Report: wpi.edu/Pubs/E-project/Available/E-project-121610-125323/

Profiling Community Assets
Team: Catherine Coleman, Sean Minor, James Seed, Juliana Wakeman
Sponsor: Violence Protection Through Urban Upgrading
Report: wpi.edu/Pubs/E-project/Available/E-project-121610-140540/

Adaptive Sustainable Urban Drainage Systems to Stormwater Management in an Informal Setting
Team: Kaylyn Marie Button, Elisabeth Jeyaraj, Rodrigo Ma, Edwin Muniz
Sponsor: University of Cape Town
Liaison: Dr. Kevin Winter
Report: wpi.edu/Pubs/E-project/Available/E-project-121610-134208/

Supporting Early Childhood Development
Team: Isaac Barbour, Heather Bell, Alyssa Gottshall, Courtney Sparrell
Sponsor: Violence Prevention Through Urban Upgrading
Liaison: Sikhula Sonke
Report: wpi.edu/Pubs/E-project/Available/E-project-121610-111027/

Figure H.2 Cape Town Middle Pages

The contact information for the individuals we met with is below for any who wish to follow up with them.

South African Embassy
Mr. Herman Jacobs
Counselor for Socio-Economic & and Development
jacobsh@dirco.gov.za

Royal Thai Embassy
Ms. Nilobol Pimdee
First Secretary
nilobolp@thaiembdc.org

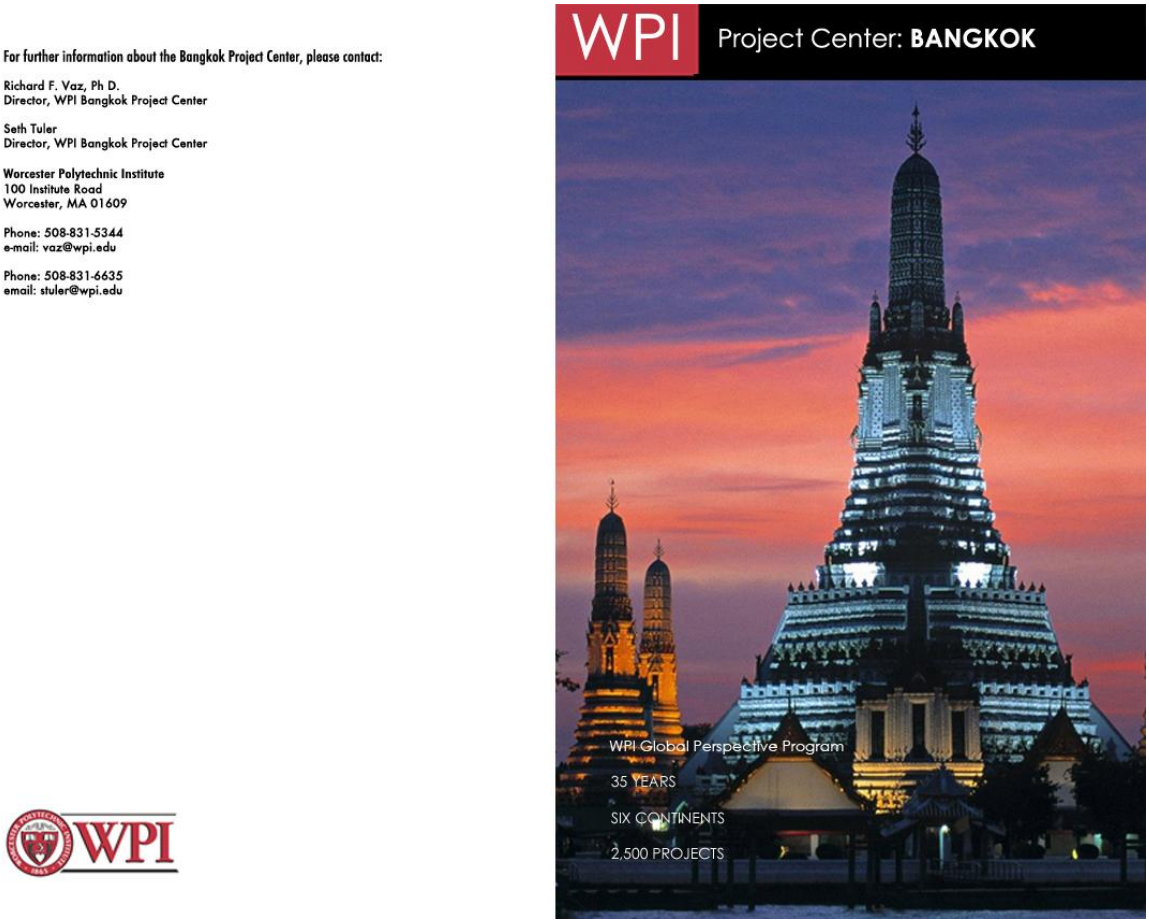

Figure H.3 Bangkok Front and Back

WPI PROJECT CENTER: **BANGKOK**

The WPI Global Perspective Program immerses students in communities close to home and around the world to research and implement projects, as scientists and engineers do, to solve problems and change lives.

Since 1989, in the beautiful land of Bangkok, Thailand, WPI student teams have tackeled numerous community problems such as health and human services at the Bangkok Refugee Center, community development in Ban Nam Khem, and Sustainable development in Rural Thailand.

The life and work experiences have presented challeneging, real-world learning opportunities for our students - and valuable data and perspectives on pressing problems for the community.

At WPI, the opportunity to pursue projects off campus is a signature element of an academic program that prepares students to put knowledge to work by developing solutions to meaningful technical and societal problems. Through the Global Perspective Program, over 50% of all WPI students complete at least one academic project off campus, in locations from Boston to Bangkok, London to Limerick, Worcester to Windhoek and Cape Town to Copenhagen. Working in small teams in close collaboration with faculty mentors, WPI students tackle problems of importance to communities around the globe. In doing so, they make a real difference and gain the confidence to take on the challenges of work and life.

NOTABLE PROJECTS COMPLETED IN 2009

Advised by Chrysanthe Demetry & Richard Vaz

Risk Communication in Thailand: A Case Study in Rayong Province
Team: Miguel Herrera, Rebecca Holmberg, Hannah Shapiro
Sponsor: Chulalongkorn University
Liaison: Dr. Seth Tuler & Dr. Nuntavarn Vichit-Vadakan
Report: wpi.edu/Pubs/E-project/Available/E-project-030609-235610/

Promoting Active Teaching Methods in Rural Thailand: A Case Study on Science Laboratory Active
Team: Nathan Climer, Matthew King, Kelsey Miranda, Sofia Zamora-Palacios
Sponsor: The office of H.R.H. Princess Maha Chakri Sirindho
Report: wpi.edu/Pubs/E-project/Available/E-project-030509-042344/

Improving the Food Delivery System at the Queen Sirikit Centre for Breast Cancer
Team: Kelly Johnson, Stacy Rudolf, Michael Taglieri
Sponsor Khunying Finola Chatamra
Report: wpi.edu/Pubs/E-project/Available/E-project-030509-234841/

NOTABLE PROJECTS COMPLETED IN 2010

Advised by Brigitte Servatius & Thomas Robertson

Post-Tsunami Ecotourism Development: Solutions for Laem Khruat Village
Team: Robert D'Angelo, Nicholas Vaccaro, Megan Welie, Alejandra Vargas
Sponsor: Population and Community Development Association
Report: wpi.edu/Pubs/E-project/Available/E-project-030410-063443/

Hydroponic Farming in Mahasarakham: Integrating Hydroponics into the Agricultural Curriculum While Introducing Entrepreneurial Skills
Team: Aubrey Ortiz, Hilary Rotatori, Elizabeth Schreiber, George von Roth
Sponsor: Mahasarakham University SIFE
Report: wpi.edu/Pubs/E-project/Available/E-project-030409-225133/

The Urban Elephant: Sustainable Roles in a Changing Society
Team: Laura-Ashley Alegbeleye, Emily Silva, Ty Tremblay, John Wyatt
Sponsor: Roong Aroon School
Report: wpi.edu/Pubs/E-project/Available/E-project-030410-230224/

Figure H.4 Bangkok Middle Pages