Instilling Essential Globalization Skills Through Internet Based International Joint-Venture Projects

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Abstract

The rapid, relentless, globalization of manufacturing and services, and the substantial productivity gains of the past several years, has created the need for well-rounded graduating engineers, understanding the business side of engineering just as well as the technical side. They also have to understand the rigors of brutal international competition, and be prepared to withstand it successfully, and even thrive in these conditions. In order to prepare our students for increased globalization, Cooper Union has undertaken the task of upgrading our course offerings, and improving our students’ business, communications, leadership, and teamwork skills throughout the curriculum. We also have created a course in which globalization is discussed at length, and applied in an Internet based joint-venture project simulation, in the GLOBETECH project. The GLOBETECH project has been successful for the past nine years, and represents one of our major achievements in preparing our graduating engineers for the challenges of the twenty-first century. This article presents our recent experiences with the GLOBETECH project, and aims to encourage engineering schools from all over to participate in this, or similar projects.

Introduction

We read daily in the press, or see on the TV news, about new subsidiaries of transnational US companies opening up, or enlarging operations in various countries of the world, mainly in South East Asia. What does this mean for our future engineers, here in the United States? How this continuous, accelerating drain of engineering and manufacturing jobs out of the USA will affect their careers? How can we best prepare our students to compete in these new conditions facing them? Do we provide the right tools for professional success? We have to ask ourselves these important questions, since their professional survival will largely depend on how well we prepare them to face the realities of our times.

We live in very exciting times. A time when, due to rapid increase in globalization and Information Technology (IT), most products assembled in the United States have more than 70% of their content supplied by various domestic and overseas firms. As examples consider the car motors fabricated in Japan for the Big Three American car manufacturers, or the many essential parts and subassemblies imported from all over by Boeing for their planes. In the information and computer technologies, and many others, engineers in different countries work and collaborate on the same project 24/7. It is a time when staying competitive, at the cutting edge of technology, bringing to market products desired by customers, of excellent quality, and at competitive prices, is absolutely essential. It is also a time when, more than ever, “no man is an island”; when timely collaboration with others across the room, or across an ocean is essential for rapid product
development, good quality, and producing at a competitive price.

To be able to perform well in this new environment, where people are continuously competing and collaborating with others around the world, we need to develop new, important business skills in our students. Besides the excellent technical skills for which our schools are renowned, we have to instill in all our students important managerial skills such as verbal and written communication skills, team work and leadership skills, negotiation skills, exposure to operations management knowledge, and above all, a clear understanding of the new, harsh business climate, and the need for continuous learning, of keeping themselves current professionally.

To create this new, global business oriented engineer, Cooper Union in the past ten years has substantially revised its curriculum and the way courses are taught. The school reevaluated its faculty and courses, introduced new courses and expanded old ones to give students new skills and exposure to business implications within most courses. As an important change, we introduced new interdisciplinary elective courses in entrepreneurship, operations and project management, ethics, business law, and global technology management. Based on the success of our graduates in the past several years, both in the companies where they work, and in the type and caliber of graduate studies they pursue, we think that our new educational emphasis is paying off.

The Global Perspectives in Technology Management Course (EID-372)

This is the course I would like to discuss in more detail in this article. This new elective interdisciplinary course was introduced the fall of 1994. The course is open to juniors, seniors, and graduate students. The course prepares the students for a world of continuous change and innovation, a world in which their professional success will depend on their flexibility to adapt, and the capacity to upgrade their skills on a regular basis. The course also aims to prepare the students for global practice by discussing the specifics of the globalization process, of how international and transnational companies are managed, and how globalization will affect their careers and lives.

The course discusses the specifics of doing business in various countries; the necessity of international agreements and standards; new technologies geared towards environmental protection, sustainable development, and new energy issues. The course also introduces students to the techniques of international negotiations, thus better preparing them for their managerial role in real life. The textbooks used for this course are: “International Business” by Charles W. L. Hill, and “Getting to Yes” by Roger Fisher and William Ury. We also make extensive use of Harvard Business School cases, and current business articles from business publications such as the Wall Street Journal, or Business Week, that illustrate and reinforce with practical examples the subjects discussed in the course.
The GLOBETECH Project

An important part of this course is a “hands-on” Internet based Simulation Project called GLOBETECH. The GLOBETECH International Joint-Venture Project Internet Simulation was developed for the first time in 1995 as a Gateway Engineering Education Coalition\(^1\) funded project. Since 1995, the GLOBETECH Project is offered every fall semester, from October to December, for an eight-week period. The main goal of GLOBETECH is to provide practical ways to enhance students’ global engineering management skills and essential communication and leadership skills.

How does this project work?

A) Student teams develop Requests for Proposals (RFPs) and responding Proposals for international joint venture projects based on given scenarios. The work involves:
  - Researching on the Internet the political, economic, technology, financial, etc., conditions in one or several countries,
  - Getting in touch with various equipment and engineering services vendors to get price and technology information,
  - Finalizing the processes, equipment to be used, and project start-up and marketing costs,
  - Writing complete, professional level, RFPs and Proposals.

B) The RFPs and Proposals are thoroughly discussed and negotiated by the various participating student teams via the Internet and teleconferences, and at the end of the simulation, contracts are awarded to the best overall proposals, one per project.

C) At the end of the simulation, students and faculty have the opportunity to participate via the Internet in the project assessment and feedback process, to discuss the positive and negative aspects of each team’s participation.

Recent GLOBETECH Experiences

In 1995 and 1996, GLOBETECH- I and II discussed automobile and vans manufacturing joint ventures in China and Thailand. In 1997, reflecting the world’s increased interest in environmental issues, GLOBETECH-III explored projects in the air pollution control and abatement field. The retrofit of a fossil power plant in Russia with air pollution control equipment, and a study to monitor air pollution along the Autobahn in Germany were the two projects discussed. In 1998, the discussion shifted towards new, renewable energy sources. GLOBETECH-IV discussed an air pollution control project in China and photovoltaic equipped dispensary vans in Africa. In the fall of 1999 GLOBETECH-V discussed fuel cell equipped taxis for Los Angeles, California, and continued the discussion of photovoltaic equipped vans for South Africa. GLOBETECH-6\(^2\) and GLOBETECH-7 discussed fuel cell technology applications and wind power farms in various countries. GLOBETECH-7 also discussed a joint-venture interactive television project in Italy. GLOBETECH-8 discussed a wind farm in China, photovoltaic equipment manufacturing joint venture in Singapore, and a hybrid car...
manufacturing facility in Romania. Our latest simulation, GLOBETECH-9, in the fall of 2003, discussed a Thermal Depolymerization (TDP) solid waste processing plant in France, and a photovoltaic equipment manufacturing plant in South Africa.

For the past nine years the GLOBETECH project has succeeded to attract more than 500 students and faculty from various countries. One of its main merits is not only to attract participation from undergraduate and graduate engineering students, but also from graduate business students (MBA level) eager to participate in an international technical joint-venture project simulation. Thus, a lively exchange of ideas and knowledge is taking place, at a high scientific level, in the engineering, financial, and managerial fields.

Student teams from Carnegie Mellon, Rensselaer Polytechnic, the Drexel University, the North Carolina Agriculture and Technology University (all four from the USA) participated in some of our simulations. Also students from the Nancy University, the Albi School of Mines, and the Toulouse School of Commerce (all three from France), the Tokyo Institute of Technology, Japan, the Iasi Technical University, Romania, the St. Petersburg Technical University, Russia, the Milan Polytechnic, Italy, and of course, Cooper Union.

Another important advantage of this simulation, in these times of drastic budget cuts, and across the board economies in all our schools, is the fact that the cost versus benefits ratio of this simulation is minimal for all participants, except Cooper Union, for which the cost is not too high either. The real-life project preparation and negotiation simulation experience benefits for the students are tremendous, and it costs very little to establish a teleconference connection, if not already available in the school. Cooper Union does all the simulation preparation, and it does not cost anything to participate in the simulation, except willingness to prepare and participate.

The fact that the students participating in the simulation were enrolled in undergraduate and graduate engineering and MBA classes contributed substantially to enriching everyone’s collaborative experience. Over the years the teams’ experiences were generally positive, directly proportional with the amount of interest, work, and interface time each team and leading faculty put into the simulation.

Project Assessment and Feedback

The Global Perspectives in Technology Management course and the GLOBETECH project have been thoroughly assessed in 1998 and 2001 by the Cooper Union Assessment Director, and also by an independent Gateway assessment team, as part of the requirements to participate in the NSF sponsored Gateway Engineering Coalition funding. This course and project have also been praised by the ABET 2000 review team which visited our college in 2000, and had only praise and encouraging words for this new and innovative program.

Regarding the feedback from the students, every year, at the end of the simulation we conduct student surveys. In all our surveys over the years, participating students and faculty have been more than enthusiastic regarding their participation, and what they learned in this program.

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To quote the recent evaluation of one of the participating student teams: “the course was a wonderful experience; it allowed us to interact with other countries, give presentations and to negotiate; we also learned about the world outside of school and what we need to succeed; Professor Jacoby has taught us many things that we will value”.

One of the student team comments regarding the simulation were: “provided a good sense of how global business is conducted in the real world; the importance of teamwork, communication, meeting deadlines, and negotiation skills were emphasized; teleconferences provided a tremendous learning opportunity through interacting in real time with teams overseas; overall, it was a great experience that offered a fun and exciting dynamics to our otherwise purely academic learning experience”.

We feel that this course and simulation gives the participating students a very realistic understanding regarding the workings of international project proposal writing and negotiating, international collaboration and competition. It makes them better understand how the real business world operates, giving them a better chance to rapidly adapt, and better compete in the unforgiving business climate waiting for them after graduation.

Simulation Challenges

One of the most difficult tasks related to this project is creating interest and recruiting other schools for participation. This work is done by the Cooper Union project leader months ahead of the project start date by researching via the Internet for faculty members that might be interested to lead a student team in this project. The search is conducted in departments such as Environmental, Industrial Engineering, Engineering Management, etc. Then, we contact these faculty members and the administration at the various domestic and foreign engineering schools, explaining the project, and asking for their participation.

Over the years we were able to develop a core of schools with which to interface regularly on this project, but, of course, we would like to attract more participants. This will be harder and harder in these days of spam e-mail, when it is so hard to decide if any particular e-mail is worth your attention… It is worth noting that due to our consistent efforts, the number of students and faculty participating in this simulation has continuously increased over the years.

Another important activity is the simulation logistic and thematic development. The projects for the next simulation and the general simulation schedule are chosen several months ahead of the simulation start date. In the same time, the Cooper Union project leader, with the help of a few Internet and computer software savvy students, develops all the required documentation and establishes the simulation Internet Home Page. It is a difficult, time-consuming process, but a rewarding one when the simulation works seamlessly, and the student teams, no matter where they are located in the world, have all the information necessary to learn, communicate, and participate in the simulation.

Our main operating difficulties in the GLOBETECH project, like in any international
real-time collaborative work, were due to the differences in school schedules, time zones between countries, and the developing status of the Internet communications. From one year to the next we have noticed substantial communication advances, and our job has been made easier, at least from this point of view. The high technical level of all students’ work and their enthusiasm for this project amazed us. We had no substantial language difficulty since most foreign students and faculty participating in the simulation had a good command of the English language and was eager to communicate and improve their language skills.

Main Benefits of GLOBETECH

This economical and very efficient project is ideally suited to prepare both graduate and undergraduate engineering and technically oriented MBA students for global practice and globalization by:

- Exposing them to new technology virtual projects that take place in various countries,
- Encouraging collaboration, negotiations, and competition among various international teams,
- Presenting a practical, stimulating and interactive way to learn global technology management issues in specific engineering fields,
- Encouraging creativity and innovation in both students and faculty to find the best technical, financial, and managerial solutions for each project,
- Creating an interdisciplinary learning atmosphere, since students and faculty with different specialties, strengths, and interests participate in the simulation,
- Encouraging international cooperative learning via the Internet. Students work in teams representing various corporations and government entities. They interface via e-mail, Internet Chat, or tele-conferences.
- Using new long distance learning technologies for research and communication.
- Improving students’ verbal and written communications, team work and leadership skills, thus better preparing them for management roles in the global economy.
- By being offered free of any charge to all participants, it does not tax the budget of any school. Schools are able to offer a superior collaborative experience at basically no extra cost.

Plans for the Future

Based on our positive experience, we plan to continue teaching the Global Perspectives in Technology Management course, and continue to offer and expand the GLOBETECH simulation every fall semester for the foreseeable future. We feel that the GLOBETECH simulation adds new depth and practical experience to the course. For the past few years, we have been working hard to develop strong ties with several engineering schools that would permit us a stronger, repeat collaboration in the simulation and course. We will also continue to actively search for new schools interested to participate in our future simulations.

The GLOBETECH simulation is only an eight to ten weeks long exercise and can be used...
in connection with many types of engineering management, economics, new energy or environmental courses, not necessarily a specific course in Global Technology Management. Participation in the simulation can also be treated as a credit project in itself, or as an extra curricular project. You can find more about this course and the GLOBETECH simulation by visiting one of our simulation sites at: www.cooper.edu/GTK-7. We will be pleased to collaborate with you in the future, or have your comments and suggestions.

Conclusions

A recent NSF funded study\(^3\) showed that business and industry still perceive substantial curricular gaps in the people communications and business management skills of our recently graduated engineers. And the pages of Business Week\(^4\) and other important business publications are regularly filled with warnings and lamentations regarding the much needed business skills for our engineers, and the lack thereof. Returning to our initial question of how we can better prepare our students and ourselves for a globalized world, one of the possible answers is obvious in this article.

By developing innovative collaborative projects that discuss practical, state of the art issues related to global practice, or by participating in this type of projects, we ensure that we, the faculty, keep pace with the latest technical and educational developments, learning from each other’s work, moving forward together. As for the students, by giving them the opportunity to participate in interesting collaborative projects that simulate the real business world they will enter, they acquire precious skills enabling them to succeed in the highly competitive, rapidly changing professional climate of the 21\(^{st}\) century.

Notes and Bibliography:

1. The Nerken School of Engineering at Cooper Union, located in New York City, was a member of the Gateway Engineering Education Coalition till 2002, one of the coalitions sponsored by the National Science Foundation. Engineering colleges from the following institutions participated in the Phase II of the Gateway Coalition: Columbia U., Cooper Union, Drexel U., New Jersey Institute of Technology, Ohio State U., Polytechnic U., U. of South Carolina.
2. Simulation numbers changed from Roman to Arabic (normal) notation for ease of identification.
4. Business Week special report “Software: will outsourcing hurt America’s supremacy?” March 01, 2004

Biographical Information:

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Since 1994 Roxanne Jacoby, a consulting engineer, is an Adjunct Professor at Cooper Union, teaching Engineering Management courses. She has developed the Global Perspectives in Technology Management course and the GLOBETECH simulation with the help and advice of Prof. Le Mee. Prof. Jacoby is interested to further global technology management, and collaborative business and management Internet based education for engineering students.