Chapter 1

Implementation and Formative Evaluation of International Research and Education in Engineering (IREE)[1]

WIN AUNG
Division of Engineering Education and Centers, Directorate for Engineering, National Science Foundation, Arlington, VA 22230.
E-mail: waung@nsf.gov

As part of the ongoing development of the International Research and Education in Engineering (IREE) program, the U.S. National Science Foundation (NSF) recently undertook several steps in a formative evaluation of the program. Implemented as pilot programs in 2006 and 2007, the program provided travel awards to U.S. students and faculty to enable them to engage in collaborative research at foreign institutions for 3-6 months, with all expenses paid. The present paper provides details on the implementation of IREE-2006 and IREE-2007, along with the results of a formative evaluation of the IREE program. The evaluation was based on trip reports submitted by IREE awardees and was conducted by NSF to determine the effectiveness of IREE with a view toward improving it. The evaluation also included input by awardees at IREE conferences. Conferences were held in 2007 and 2008. One of the pilots, IREE-2006, was also evaluated by an independent outside firm that specializes in program evaluation. The outcome of this multi-level formative evaluation is described in the present paper which also outlines potential new ideas for the future IREE program.

INTRODUCTION

Science and Engineering Indicators 2010 [1] and its companion report, Ref. [2], both recently issued by the U.S. National Science Foundation (NSF), contain a broad

[1] Opinions and conclusions contained in this paper are those of the author and do not represent the official policy of any organization.

collection of quantitative data about U.S. science, engineering and technology. Comparisons with other nations and regions are made, and the relative competitiveness of the U.S. scientific, engineering and technological enterprise is examined. The data clearly show the growing strengths of many nations and economies, arising from the "flattening" of the globe [3], which has led to increased expenditures in research and development (R&D) in many previously underperforming nations; the legacy gap in R&D spending between the "rich" and "poor" nations is narrowing.

During 1996-2007, the growth of R&D expenditures in real dollars in India, South Korea, Taiwan, Thailand, Singapore, Malaysia and China outstripped significantly that in the U.S. Data from OECD show that the growth rate for total R&D in the EU-27 nations and in the U.S. were 3.3%, while in China it was above 19% [1, p. 4-34 / 4-35]. In Ph.D. production for 2006, the U.S. awarded about 30,000 degrees, the largest number of any nation, but China, at 23,000, is rapidly catching up [1, p. 2-35].

The trends for R&D expenditures, articles published, number of researchers, and high technology exports for five countries or regions, are pointing to the growing strengths of Asia, particularly China [2]. These trends are consistent with those underscored by NSF in an earlier report [4].

Concomitant with economic globalization and the increased parity in research performance in many countries, faculty and students in the U.S. are increasingly interested in research-abroad and study-abroad opportunities. This is particularly true in engineering [5]. Responding to the needs, NSF implemented several initiatives aimed to providing funding for international cooperation in research and education, and for enhancing the quality of education in science and engineering by providing students with international experience.

In 2006, the Division of Engineering Education and Centers (EEC) in the Directorate for Engineering (ENG) at the NSF initiated a pilot program entitled "International Research and Education in Engineering" (IREE). IREE provided supplemental funding for existing research awards funded by divisions in ENG. Funds are earmarked for medium-duration research visits to foreign research laboratories. The constituencies of this research-abroad program were early-career researchers, defined as faculty at or below the rank of associate professor, post-docs, and graduate and undergraduate students who are U.S. citizens or permanent residents.

THE OBJECTIVES OF IREE

IREE has two main goals or objectives:

> Objective 1: To enhance international perspective for U.S. early-career faculty and students.
> Objective 2: To leverage international partnerships to enhance education and research innovations in U.S.

Objective 1 is tied in with accreditation criteria required of engineering programs in the U.S., whereas Objective 2 is motivated by a desire by NSF to tap into the growing capability and capacity in research and education at academic and R& D centers overseas.

The various facades of the IREE model may be depicted graphically as shown in the logic model developed by IDA/STPI; see Figure 1. The important inputs to the program

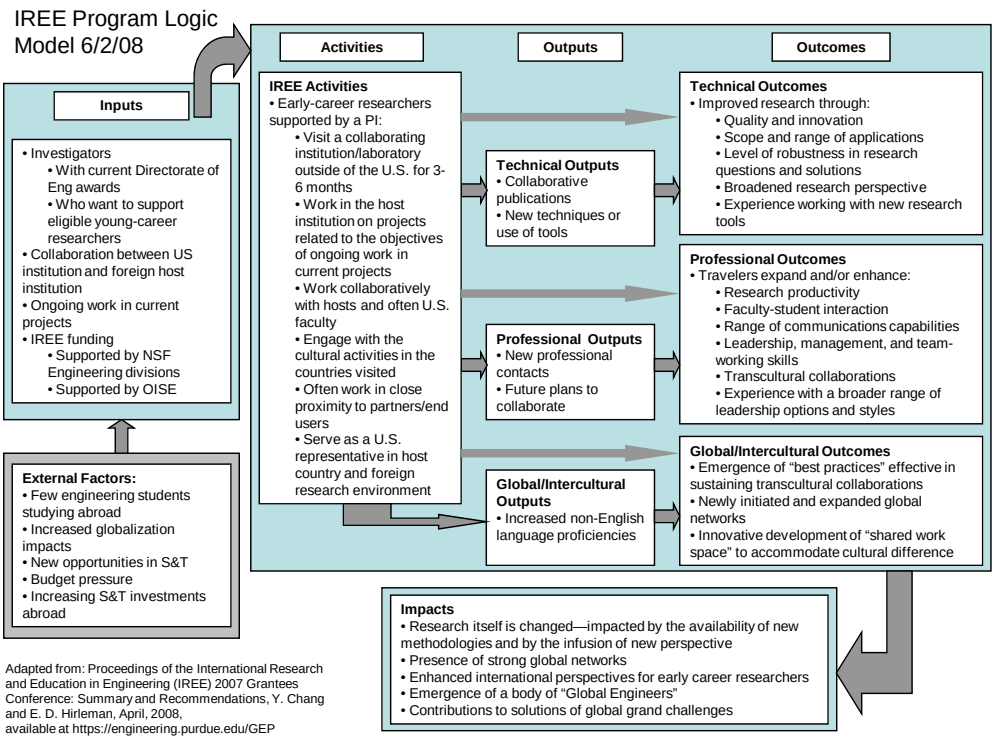

FIGURE 1
IREE LOGIC MODEL (CHART CREDIT: IDA/STPI)

are the intellectual and financial resources including the existing NSF awards to which the supplements were added. These inputs led to a series of activities one of which was central to the IREE model, namely, the international travel and research abroad program.

In terms of deliverables, IREE may be examined by its outputs, comprising the technical outputs which include the publications and the new tools and methodologies that emerged from the international collaboration. The professional outputs are represented by the international contacts established and the plans created for extension of the collaboration. Intercultural outputs are represented by the broadened global perspectives of the travelers/researchers including increased proficiencies in foreign languages.

In addition, IREE may also be examined in terms of the Outcomes achieved by the researchers/travelers. As in the case of the Outputs, here the accomplishments are technical, professional and global/intercultural.

Finally, the Impacts of the IREE model may also be discussed. The items listed are qualitative but important, and are discussed in some details in the proceedings of the 2007 and 2008 IREE conferences.

IREE-2006 AND IREE-2007

In 2006 and 2007, EEC provided base funding to establish IREE as a pilot program. A total of 177 IREE proposals were received in 2006 and 152 in 2007. These proposals came from an eligible pool of approximately 4,500 existing awards funded by programs in ENG.

IREE supplements were awarded to 115 existing ENG awards in 2006 and to 132 existing awards in 2007, making a total of 247 awards. During these two funding cycles, IREE funded a total of 469 early-career researchers in 104 institutions, comprising of 102 academic institutions and 2 small firms. Among the early-career researchers whose travels were funded, 137 were faculty members and 332 were students and post-docs, primarily the latter. The 247 awards involved 247 Principal Investigators (PIs). Out of this, 45 were female, representing 18%. For 2006, 15% of the awards were to female PIs; for 2007 the corresponding number was 21%.

The IREE pilot program provided funding for supplement awards to existing NSF awards supported by individual programs in the Directorate for Engineering (ENG) at NSF. All ENG awards were eligible to receive supplements. Announcement of the availability of funding was made through a "Dear Colleague Letter" sent directly to the awardees at the start of each of the solicitation cycles in 2006 [6] and 2007 [7].

Divisions in ENG and the Office of International Science and Engineering (OISE) joined as partners to co-fund the 247 supplement awards in 2006 and 2007. In each of these funding cycles, OISE contributed an average of 50% of the total funding. EEC contributed 25% the remaining 25% was contributed by the other divisions in ENG.

The IREE program provided support to enable early-career researchers in the United States to gain international research experience and perspective, while enhancing innovation in their U.S. domestic research programs. Through extended-stay research visit to institutions abroad, U.S. researchers sought to foster interaction between U.S. institutions and their foreign counterparts through a program of pre-defined collaborative visit that related to the research and education activities at the home institutions of the U.S. researchers.

PROPOSALS, AWARDS AND FUNDING FOR IREE IN 2006 AND 2007

As shown in Table 1, the total number of proposals received was 177 and 152 in 2006 (IREE-2006) and 2007 (IREE-2007), respectively. The numbers of awards made were 115 and 118, respectively, for those years giving corresponding success rates of 65% and 78% for proposals.

The total requested budget was $7.14M and $4.93M for 2006 and 2007, resp. The total expenditures were $3.27M and $3.91M (rounded) for 2006 and 2007, resp., with success rates of 46% and 79%, resp.

The drop in proposal submission in 2007 as compared to 2006 was caused by a new eligibility criterion in the 2007 proposal solicitation that required all awardees to be either U.S. citizens or permanent residents.

For IREE-2006, the co-funding shares from EEC ("IREE Funding"), OISE, and ENG division programs are indicated in Figure 2. The chart is from the portfolio evaluation carried out by IDA/STPI; see below for more details. (As of this writing, the

	IREE-2007	IREE-2006
EEC IREE FUNDS:	$1,000,000	$981,684
ENG DIVISION CO-FUND:	$1,225,891	$678,620
OISE CO-FUND:	$1,684,656	$1,606,699
TOTAL FUNDS:	$3,910,547	$3,269,003
TOTAL REQUEST:	$4,925,838	$7,137,342
NO. OF PROPOSALS:	152	177
NO OF AWARDS:	118	115
$ SUCCESS RATE:	79%	46%
PROPOSAL SUCCESS:	78%	65%

TABLE 1
PROPOSALS, AWARDS AND FUNDING OF IREE IN IREE-2006 AND IREE-2007

portfolio analysis for IREE-2007 has not been carried out.) The significant contributions to all divisions by EEC and OISE may be noted. Significant co-funding by the divisions in ENG was also made by other divisions in ENG (DMI, EEC, CMS and CTS).

The 247 awards from IREE in 2006 (IREE-2006) and 2007 (IREE-2007) provided support for 469 early career researchers (137 faculty members and 332 students and post-docs). The number of awardees to each of 45 destination countries is shown in Figure 3. The number of awardees to each country ranges from a high of 30 to Germany to several countries each with a single early career researcher from the U.S. Next to Germany, other countries with high numbers are: UK (25), France (22), China (19), and Japan (18).

FUNDING ALLOWANCES

NSF awardees supported by divisions in ENG were notified by e-mails concerning the IREE opportunities for supplemental awards. In IREE-2007, the Dear Colleague Letter

was modified to add the stipulation that early-career researchers traveling under an IREE award must be U.S. citizens or permanent residents of the U.S. An additional requirement in year 2007 was that all undergraduate students must have research experience prior to the foreign travel under IREE, and that Principal Investigators could include a request for funds to support undergraduate students under the active award before the start of foreign travel under IREE.

Eligible expenditures included the incremental costs of foreign travel for U.S. early-career researchers – undergraduate and graduate students, postdoctoral fellows, and tenure-track or tenured faculty members who are assistant or associate professors or their equivalent – who are working on existing NSF awards. Requests to support the travel of faculty members must also include at least one student. The participation of members of underrepresented groups was strongly encouraged. Allowable expenses provided under IREE included nominal and reasonable amounts for local research expenses at the host institutions/laboratories. The proposed foreign activities must fall within the general scope of the existing NSF-funded project for which supplemental funding is requested.

The funded time-spent in foreign institutions/laboratories for each researcher must be between three (3) to six (6) months.

It was expected that the major portion of the NSF funding will go toward the travel-related expenses, and can also include travel support for faculty advisors for program coordination and supervision.

General guidelines for allowable budget categories are:

a. Up to $1,500 transportation costs for each researcher.
b. Local subsistence allowance of up to $2,500 per month (for three-six months) for each researcher. NSF expects that foreign counterparts will recommend reasonable, long-term lodgings for U.S. visitors in their countries.
c. Up to $2,250 travel funds for faculty advisors' short visits for purposes of supervision and coordination.

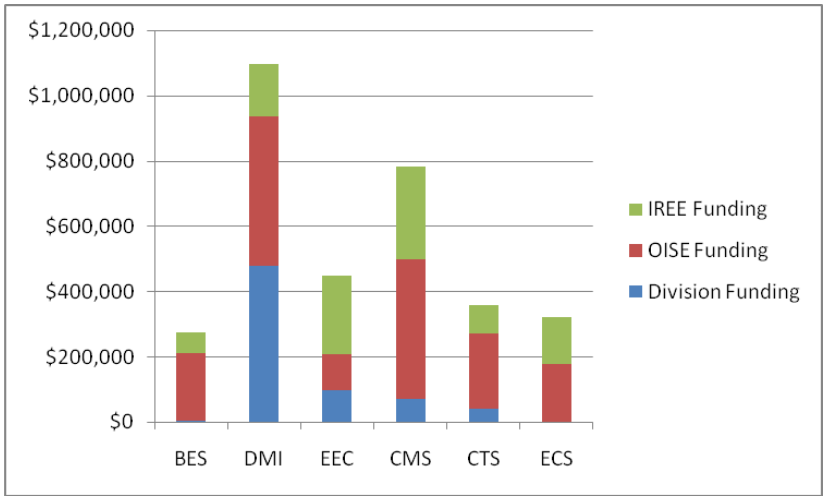

FIGURE 2
CO-FUNDING OF IREE IN 2006 (CHART CREDIT: IDA/STPI)

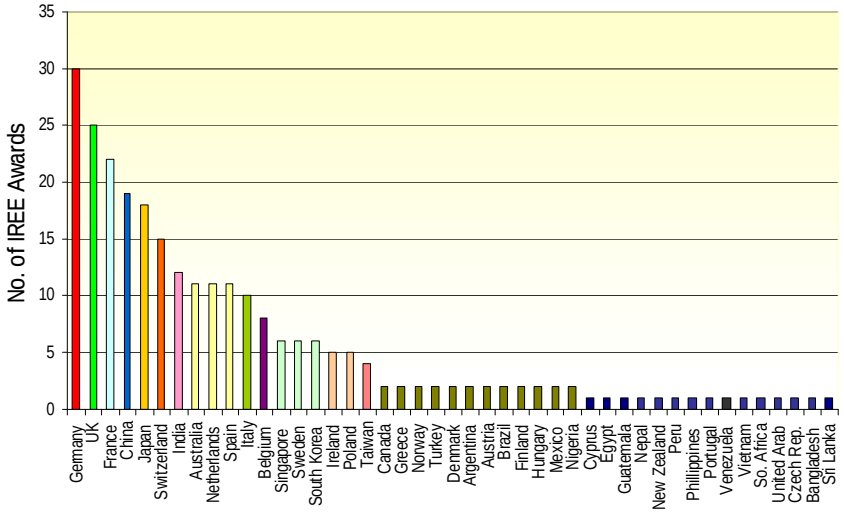

FIGURE 3
NUMBER OF 2006 AND 2007 IREE AWARDS HOSTED IN 45 COUNTRIES

d. Up to $1,500 for administrative expenses, which must be itemized and justified, associated with the international cooperation at the foreign institution.
e. Up to $1,000 per month stipend for each undergraduate researcher.
f. To encourage the recruitment of new undergraduate students into the research programs of current awards, $6,000 per student may be requested to provide research experience to undergraduates (REU) who lack such support, prior to the foreign travel under IREE, provided the program of research (collaborators; special project; timeline; etc.) for the student is properly defined and justified in the IREE proposal.
g. The budget must include the costs of one domestic trip per year for researcher(s) and faculty advisor to travel to Washington, D.C. to attend and present a report at a post-visit three-day workshop/conference.

Within three months after completion of the trip, each traveler was required to submit a trip report in fulfillment of the condition of the grant award. Travelers were provided with a report template that outlined the topics that must be covered, as shown in the Appendix. Faculty advisors and researchers were expected to prepare a trip report to be submitted to NSF with details of the experience of the trip, and to later present their report at a specially convened conference.

FIGURE 4
SCENES FROM 2007 (UPPER LEFT PHOTO) AND 2008 (UPPER RIGHT AND LOWER PHOTOS) IREE CONFERENCES

FORMATIVE EVALUATION METHOD

Since IREE has been implemented as pilots only and has had a relatively short history with a limited number of awards, no formal, summative assessment has been carried out; however, with a view toward obtaining feedback from awardees in order to uncover areas in need of improvement in the IREE program, NSF undertook several steps in a formative evaluation of the program. The process is akin to formative assessment in teaching and learning [8].

The theory of formative evaluation of programs has been well established [9] and has been applied extensively; e.g. [10]. The method used in evaluation of the IREE program includes the following components.

- In 2007, through funding from NSF, a team led by Prof. Dan Hirleman, Head of the School of Mechanical Engineering at Purdue University, examined the trip reports submitted by travelers funded under IREE-2006.
- All awardees that had completed travel by October, 2007 were also invited to attend an IREE conference at Purdue University to present their accomplishments and share experiences; see Figure 4.
- In 2008, Purdue University repeated the process for awardees supported in IREE-2007 via their trip reports and a 2008 IREE conference (Figure 4).
- Furthermore, trip reports for IREE-2006 were also independently evaluated IDA/STPI, an outside firm that specializes in program evaluation. This assessment report was issued in April, 2009.

In their trip reports, awardees discussed their accomplishments in accordance with a number of required, pre-set topics, as shown in the Appendix. Highlights showing examples of accomplishments reported by awardees are given in Figures 5-7.

Based on the outcome from the informal assessment, the unofficial tentative conclusion is that the IREE Pilots did achieve the intended goals as described above.

Further details are given below.

Awardees' Trip Reports and IREE Conferences of 2007 and 2008

The external factors leading to the establishment of the IREE program, the awardees activities, their outputs and outcomes achieved, as well as the impacts of the program were discussed at the IREE conferences of 2007 and 2008. The first was held in October 2007 at Purdue University for awardees funded in IREE-2006. The second conference was held in Washington, DC in May 2008 for the IREE-2007 cohort as well as those 2006 awardees whose travel was delayed.

The 2007 conference was attended by 170 participants. These were comprised of 47 faculty members, 113 graduate students, and 6 undergraduate students who had completed their trips. Six NSF staff members also attended. The objective was to provide a venue for travelers/researchers to present their accomplishments, and to share their research-abroad experiences. The implications of IREE model were discussed throughout the conference program. Awardees' criticisms and recommendations for improving the IREE program were summarized leading to a set of suggestions for best practices that was a significant part of the proceedings [11].

Participants, in their discussion and presentations at these conferences and in their trip reports, generally gave positive comments about their experiences in relation to IREE

Objective 1 and Objective 2. Among the benefits cited by early-career faculty and students are:

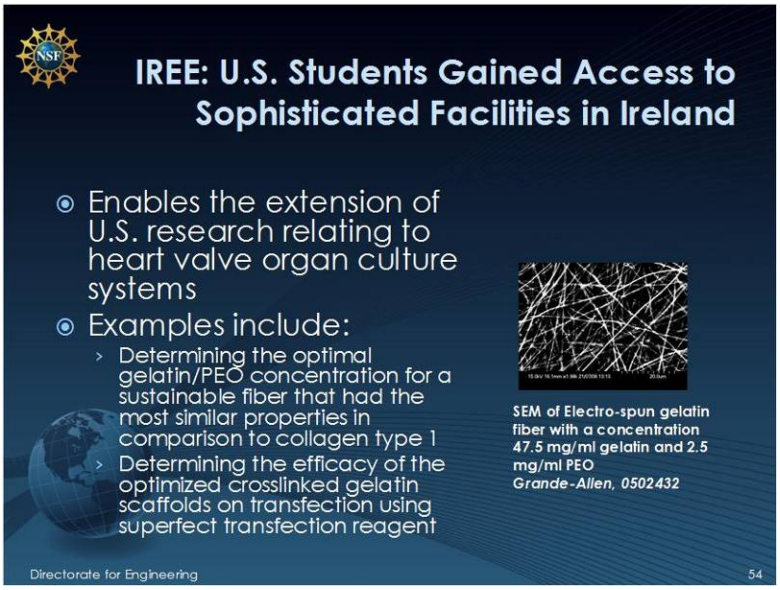

FIGURE 5
HIGHLIGHT OF IREE ACCOMPLISHMENT – EXAMPLE 1

FIGURE 6
HIGHLIGHT OF IREE ACCOMPLISHMENT – EXAMPLE 2

"…This IREE funding enabled three U.S. researchers to build bridges to two research organizations with interests and skills complementary to ours."
"This visit created a pathway for complex applications of ongoing research under the CAREER award and greatly enhanced the quality of our ongoing work by establishing stronger links…With our international collaborators, we have written journal papers and have collaborated on grant proposals."
"…the primary message to take away is the great value of the program. In addition to specific research accomplishments, there were many long-term, positive outcomes."
"All the participants viewed this as a tremendous opportunity for personal and professional growth and greater understanding of our global community. The less-visible, more personal impacts are among the most compelling reasons to continue and expand the IREE program."
"…provided the opportunity…to enhance her research capabilities while building ties with an international university. It further provided the opportunity for her to get first-hand knowledge of international upcoming technology and business and government practices..."
"As a consequence of his visit, we now know that ATRP may be used to make adsorptive ion exchange membranes…Thus ATRP could be a valuable new technology for manufacturing high capacity ion-exchange membranes."
"One important scientific accomplishment was to show the significant difference between fluorescence from aluminum and gold nanocavities…"
"…we have established what we expect to be a longer-term collaboration and exchange between the two groups, which is significant in its own right."
"The IREE program is of high value and impact and should definitely be supported on an on-going, NSF-wide basis. Much of its value lies in the fact that this type of travel support is difficult to obtain through other sources."

The proceedings of the 2007 conference were edited by Chang and Hirleman [11]. Focused on the IREE-2006 Pilot, the proceedings include a section on Summary and Recommendations concerning the future direction of the IREE program. The proceedings, along with the Powerpoint presentations and the approximately 100 trip reports that were a part of the conference, may be accessed on the web [11].

Following recommendations by participants of the 2007 conference, the 2008 conference was planned as a pre-trip conference to increase benefits to awardees for their upcoming trips. The proceedings for the 2008 conference have been published and may be accessed online along with all trip reports [12]. Some of the details of the conference are as follows:

- The 2008 conference was purposefully designed to allow maximum time for interaction between conference attendees.
- The session topics ranged from general best practices of IREE program to travel tips.
- An expert on cross-cultural activities was also invited to give a plenary from the perspective of cultural sensitivity and enhancing the global competencies of IREE grantees.
- Graduate students comprise the majority of IREE travelers at both 2007 and 2008 conferences.

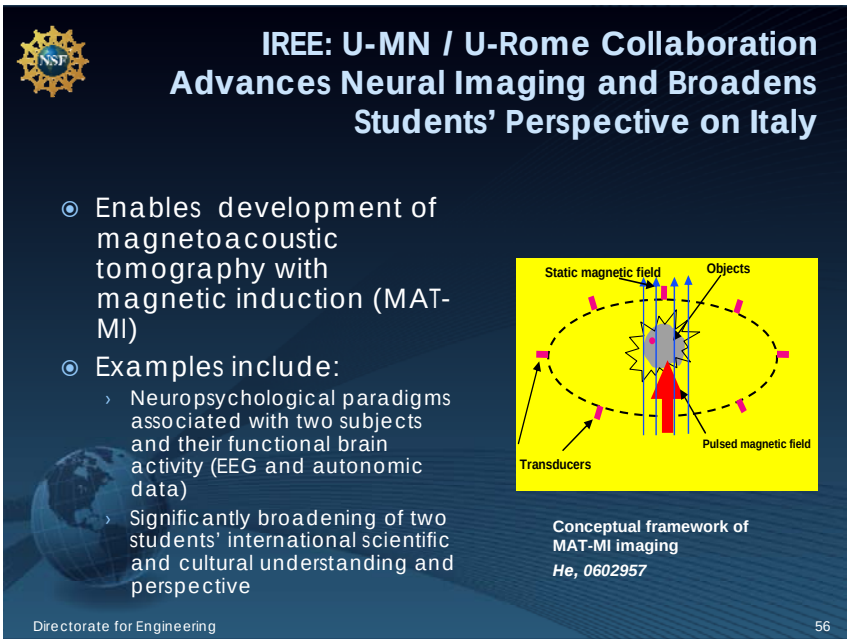

FIGURE 7
HIGHLIGHT OF IREE ACCOMPLISHMENT – EXAMPLE 3

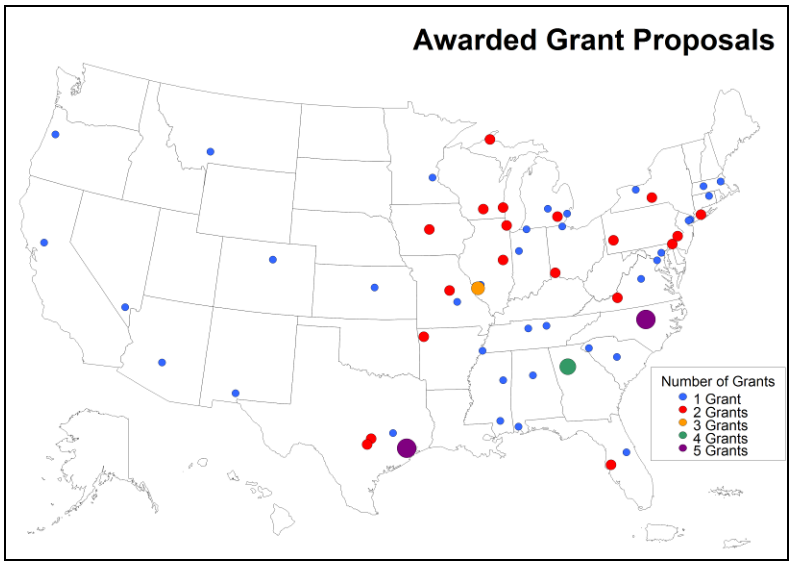

FIGURE 8
GEOGRAPHIC DISTRIBUTION OF PARTICIPATING INSTITUTIONS IN IREE-2006 AWARDS (CHART CREDIT: IDA / STPI)

- For first time travelers who have never left U.S., discussions of health and safety issues, packing tips, as well as international standards, better prepared and eased their travel-related anxieties.
- Among the attendees, 88% had not previously traveled to the IREE site. Of the group 29% were undergraduate students; 33% were graduate students; 5% were Researchers/Staff. In addition, 33% of the attendees were faculty, most of whom are listed as principal investigators of the IREE grants.

Topics and issues discussed in the 2008 grantees conference sessions included the following:

- A broad overview of the history, cultures, and languages in the respective global region.
- Some generalizations/common themes can be drawn across the countries within the respective global region.
- A broad overview of the professional and technical practices in the respective global region.
- Most striking similarities/differences that were observed by awardees between research overseas compared to research at home university.

The trip reports provide documentation of key accomplishments and outcomes achieved by each traveler. Examples are given in Figures 5-7.

PORTFOLIO EVALUATION OF 2006 AWARDS BY IDA / STPI

In 2008, the EEC Division awarded a contract to IDA Science and Technology Policy Institute (STPI) to conduct an evaluation of the trip reports submitted by the 2006 IREE travelers. A final report was issued by STPI [13] in April 2009.

Applying a text analysis method to the 2006 trip reports included in the 2007 IREE conference proceedings, STPI paid particular attention to institutions participating in IREE, level of education of travelers, countries visited, and the types of activities that are mentioned in the trip reports. STPI conducted quality checks by tallying the activities and categories of output indicated in the reports, using a frequency count for the number of occurrences of each activity.

STPI examined the geographical distribution of the 60 U.S. institutions receiving IREE funds and sending students or post-docs abroad in 2006. There was a broad geographic distribution of the institutions as may be seen in Figure 8. Most of the awards, however, went to institutions in the Midwest or on the East Coast. As shown in Figure 9, the majority of the institutions (36 out of 60) sent only graduate students. Three of the 60 institutions sent only undergraduate students, while 10 out of 60 sent all three categories of travelers: undergraduates, graduates, and postdoctorals. The largest number of travelers was in bioengineering. Other high ranking disciplines are listed below.

Bioengineering:	32 out of 60 participating institutions
Metallurgical Engineering:	18 / 60
Chemical Engineering:	14 / 60

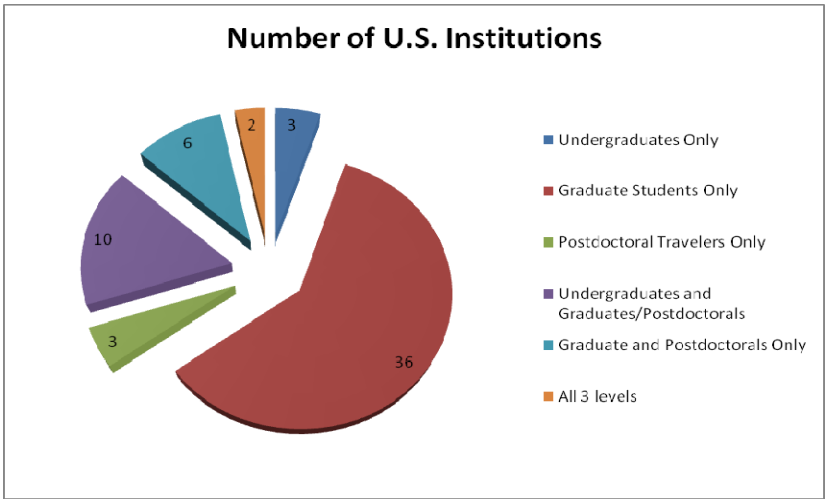

FIGURE 9
NO. OF PARTICIPATING U.S. INSTITUTIONS BY LEVEL OF EDUCATION OF IREE TRAVELERS, IREE-2006 (CHART CREDIT: IDA/STPI)

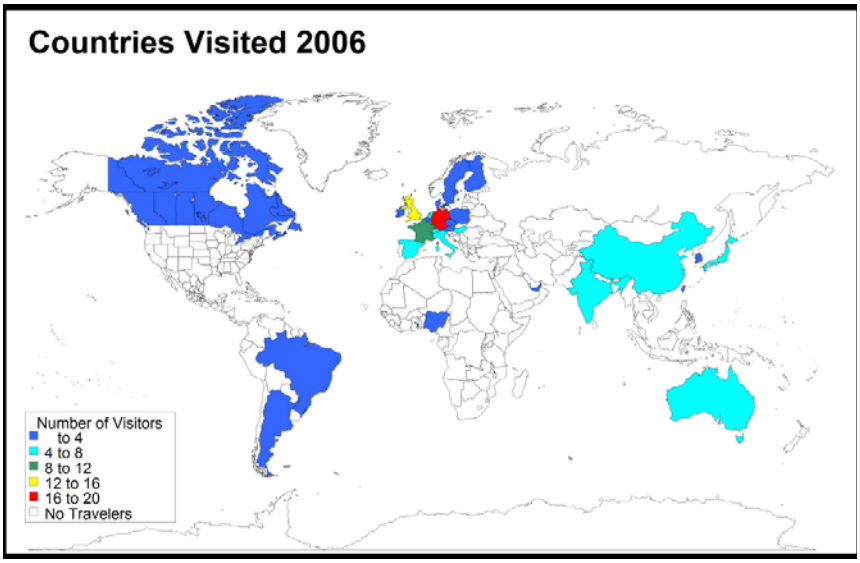

FIGURE 10
LOCATIONS OF COUNTRIES HOSTING IREE TRAVELERS, IREE-2006
(CHART CREDIT: IDA / STPI)

Mechanical Engineering:	14 / 60
Electrical Engineering:	11/60
Civil Engineering:	7 / 60
Env. Eng., Ind. Eng., Phys:	6/ 60

The continental locations of countries hosting IREE travelers funded in 2006 are shown in Figure 10. The leading countries were Germany, UK and France. There was one country in Africa (Nigeria). There were only two countries in Latin America: Argentina and Brazil. No student went to the Russian Federation or to countries in South or Southeast Asia. In 2007, however, IREE travelers added Venezuela, Peru, Vietnam, Sri Lanka, Bangladesh, Philippines, and Nepal to the portfolio of foreign countries for U.S. early-career researchers.

The STPI evaluation looked into the outputs of these students and postdoctorals during their research-abroad experience. The frequency counts in reports submitted by undergraduates, graduate students and postdoctorals were compiled with respect to Publications, Conference Papers, New Tools/Methods, Language Acquisition, Continuing Collaborations, and Future Exchange of Researchers/Students. The findings as reported by STPI are charted in Figures 11-13.

While noting the substantial output, outcomes and impacts of awardees accomplished through IREE funding, the STPI report also points out the need for IREE to narrow its focus and concentrate support for graduate students since, as a group, they appear to benefit more from a research abroad experience. STPI also recommends that NSF uses the IREE Program to identify barriers to international collaborative research and help minimize them. Furthermore, the tracking of the researchers' research activities abroad is suggested.

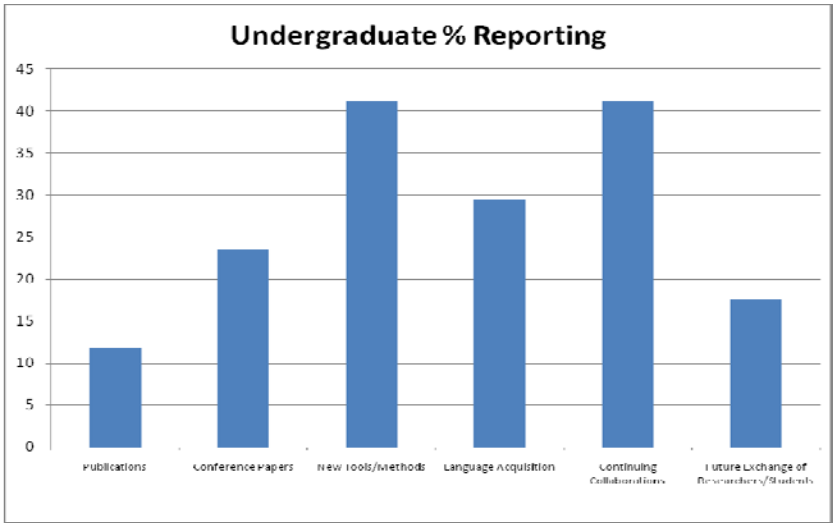

FIGURE 11
DISTRIBUTION OF SELECTED OUTPUTS REPORTED BY UNDERGRADUATES, IREE-2006 (CHART CREDIT: IDA/STPI)

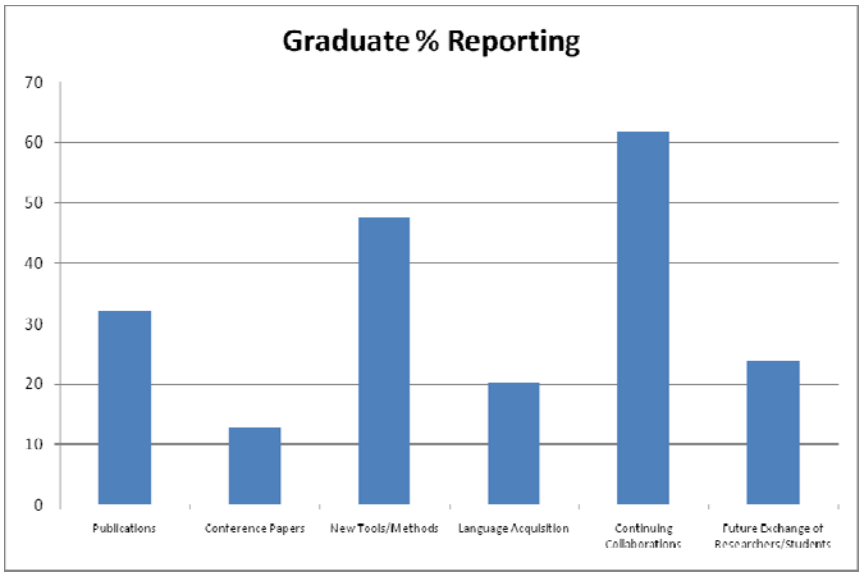

FIGURE 12
DISTRIBUTION OF SELECTED OUTPUTS REPORTED BY GRADUATE STUDENTS IN IREE-2006 (CHART CREDIT: IDA/STPI)

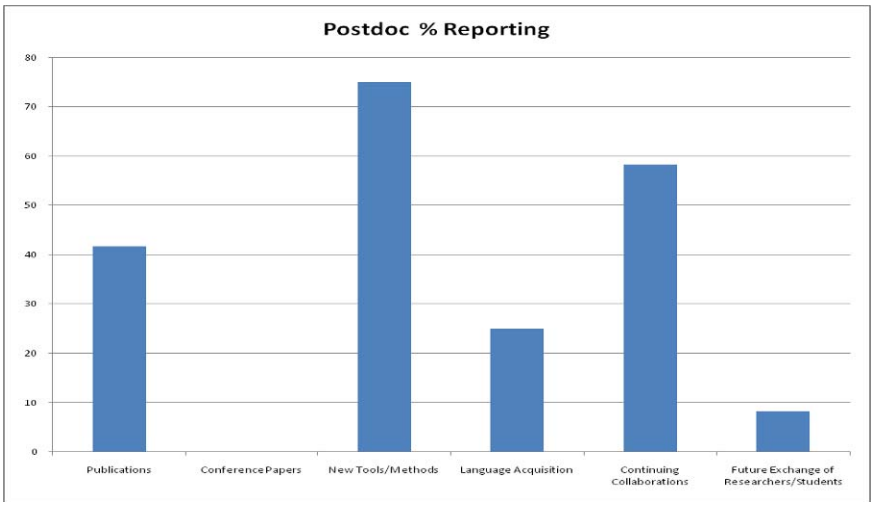

FIGURE 13
DISTRIBUTION OF SELECTED OUTPUTS REPORTED BY POSTDOCTORALS IN IREE-2006 (CHART CREDIT: IDA/STPI)

CONCLUSIONS AND FUTURE DIRECTION

In this paper, the results of an informal, formative evaluation study of the IREE program has been presented along with the background information on its objectives, development. The implementation of the 2006 and 2007 pilots has been described. There has been very positive feedback from the IREE conferences of 2007 and 2008. The IDA / STPI evaluation of 2008/2009 identified many positive features of the IREE program, as well as areas for improvement.

To date, the assessment results for IREE have been very encouraging, but they also point to the need for possible improvement and modification in the key features of the 2006 and 2007 pilots. Specific issues were brought to light during the formative assessment. Some of the issues emerged from awardees trip reports and awardees' discussion during the 2007 and 2008 IREE conference, while others came out in the ADI/STPI evaluation.

Areas especially deserving attention include the following:

- To enable awardees to derive maximum benefits from the research-abroad activities funded by IREE, the IREE program should provide pre-trip orientation. The orientation should focus on basic knowledge about life in the destination country with respect to its culture, history, language, and issues related to healthcare, security, local travel, housing, and social and business aspects. In addition, travelers must be introduced to the people and facility of the hosting institution and laboratory.
- The IREE program should ensure that mentors be assigned to students both in the U.S. and while they are overseas, and that mentors are not only accomplished researchers but also are experienced in international cooperation in engineering research and education.
- IREE should provide for the continued engagement students in research after their return from their foreign assignments.
- IREE should emphasize support for graduate students as well as undergraduate students.
- IREE should provide for the close monitoring of students' progress while on assignment abroad.
- The IREE program should ensure the provision at the host institution of a judiciously pre-designed program of trans-national activities for the duration of visit by U.S. students aimed at enhancing the intellectual merit and broader impacts of the IREE-Site, a program that is not limited to the duration of the visit(s) by U.S. researchers to the foreign laboratory.

In order to provide some guidance on how some of the above recommendations could be carried out in practice, the IREE program funded Purdue University to implement IREE-2010, beginning in January 2010. Using China as a test bed, IREE-2010 will support 59 graduate and undergraduate students to travel to China. The students are selected from across the U.S. through a fast-track, national recruitment campaign that has turned out to be hugely successful, resulting in 360 applications received for the 50 positions originally advertised. Pre-trip orientation for subsets of the students will be conducted in the U.S., China, and through the internet, followed immediately by placement to various laboratories in China in a three-month research assignment. The outcome from IREE-2010 will be incorporated into the future IREE program, which will

continue to evolve and improve, but always staying true to its dual objectives of enhancing the global perspectives of U.S. students in engineering, while enhancing innovation and productivity in research and education.

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Win Aung received his M.S. and Ph.D. degrees in Mechanical Engineering from the University of Minnesota. He was a Member of Technical Staff at Bell Laboratories, Whippany, NJ, USA during 1969-1974. In 1974, he joined the U.S. National Science Foundation as Program Director of the Heat Transfer Program. He was appointed to the U.S. Senior Executive Service in 1985. He received the first NSF Federal Engineer of the Year Award in 1985. During 1976-1996, he held adjunct and visiting professorships at several universities in the U.S. and abroad. In 1994, he founded the International Conference on Engineering Education (ICEE) series and, in 2004, established the International Conference on Engineering Education and Research (iCEER) series. He co-founded the International Network for Engineering Education and Research (iNEER) in 2000, and is serving as its Secretary-General. He is the principal editor of the iNEER Innovations Series. He has published over 120 technical papers, and has edited or co-edited more than 10 books. He is a Fellow and Life Member of the American Society of Mechanical Engineers. He was awarded the *Doctorem Honoris Causa* (honorary doctorate) by VSB – Technical University of Ostrava, Czech Republic, in 2005, and by the University of Pećs, Hungary in 2008. In 2005 he received the Medal of Merit from the Silesian University of Technology in Poland. He was a member of the Standing Committee on Theory and Fundamental Research of the ASME Heat Transfer Division, the ASME Board on Engineering Education, and the ASME Council on Education. He was an editor of Transactions of ASME, Journal of Heat Transfer.

APPENDIX

TRIP REPORT TEMPLATE FOR IREE-2006 AND IREE-2007

A. Title of Current NSF Award
B. Abstract
C. Introduction
   - Name of awardee institution for current NSF award
   - A brief summary of work being carried out under current NSF Award
   - Reasons/Rationale for international cooperation carried out under IREE
   - Provide an explanation of how the researcher was selected and why he/she was the best qualified candidate
   - Anticipated research and education outcomes
   - Information about host laboratory
   - Name of travelers and the early-career category of each (assistant professor, associate professor, post-doc, graduate student, undergraduate student
   - Dates of travel
D. Research Activities and Accomplishments of the International Cooperation
   - Program of research carried out during international research experience
   - How the work on-site is related to the work of the current NSF award
   - A substantive description of the general interaction between researcher and host laboratory during the international research experience
   - Discuss the research accomplishments of student(s) during the trip
   - Relevant schedule, if applicable
E. Any other information that relates to the intellectual merit of the research carried out abroad
   - Be sure to include at least two graphics that highlight the progress of the research
   - Please describe traveler's international activities under the IREE award that are relevant to enhancing the broader impacts criterion of NSF merit review.
   - How the supplement award promoted diversity
   - How the supplement award helps expand the original scope of the current award
   - How the travel fosters closer future interaction between awardee institution and host institution
   - How the visit has helped to enhance international perspective for the U.S. researchers.
   - Include information on activities that increased the researcher's familiarity with foreign languages, culture, and applicable technological trends and business practices
D. Recommendation for "Best Practices" in future operation of the IREE Program