
AC 2011-2169: SURVEY BASED COMPARISON OF PERCEPTIONS AMONG CURRENT INTERNATIONAL ENGINEERING GRADUATE STUDENTS AND ALUMNI AT US UNIVERSITIES

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Survey based comparison of perceptions among current international engineering graduate students and alumni at US universities

Abstract

Perceptions of current graduate international engineering students and alumni regarding the US engineering education system tend to be influenced by their most recent experiences and expectations. These perceptions differ based on changing engineering educational environments, career progression in their career, and challenges faced during the different phases of graduate studies. Understanding the perceptions of alumni and current students would lead to several positive outcomes such as practices and improvements in the US graduate engineering education system, better student planning, and increased enrollment of quality international graduate students. International engineering graduate students and alumni studying at US universities were invited to complete an online survey. Results from the survey indicate that perception of international graduate students slightly differ when compared between current students and alumni. Survey findings also shows that US institutions have been making progress by providing enhanced funding, comparable safety/ security, and information to make the students well prepared for post graduation job.

Introduction

Providing higher educational degrees is a major industry for several countries including USA, Australia, Canada, UK, and Germany¹. The USA has been a long-term leader in higher education, and the Association of International Educators in a recent report calls for an initiative at the national level for clearly communicating the advantages of higher education in the USA. Enrollment of international students have seen vicissitudes in different parts of the world leading to concerns and targeted efforts to recruit quality students. Several countries are investing in marketing and recruiting international students because international students offer number of benefits. Some of the benefits that international students bring to US schools include financial profit, filling graduate research assistant vacancies, helping establish international ties, and globalizing perspectives^{1,2}. Cultural diversity among students in academic institutions brings different perspectives and helps with growth. International students in return get a higher quality research experience, global exposure, diversity and an excellent education. Recruitment and retention of quality students have been discussed in several literatures in the past^{3,4,5}. Most of these efforts are focused on survey of current students and academic institutions.

Alumni are an important source of information to institutes of education⁶, but engineering alumni are sometimes overlooked in research efforts. They can provide timely perspectives regarding their experiences within the US education system. Over the years, many institutions have conducted survey-based research of alumni population for degree satisfaction, curriculum improvement and the job market for its graduates^{7,8,9}. Alumni surveys have been used for other purposes too, including assessment of undergraduate research experiences and assessing the role

of higher education institutions^{10, 11}. The authors are not aware of any reported studies in literature contrasting alumni survey data to current students for self-evaluation of institutional effectiveness. However, this approach can provide information leading to an overall better experience for graduate students. This will in turn provide mechanisms for recruitment and retention of quality students.

To create a strong recruitment and marketing plan, an important step for an institution is to consider the experiences of both the current international students and alumni studying in the host country. Understanding the needs of international students is important¹². Efforts to understand current international students' experiences and comparing those with alumni experiences would provide insight into efforts by US institutions to provide better educational experiences to students^{13, 14}. Some of the research questions explored were related to academic satisfaction and overall experience from several different perspectives as well as preparedness for employment in their home country and/or in the host country after graduation^{15, 16}. These insights can help institute administrators to solve problems faced by students and to emphasize the positive aspects in ongoing recruitment process as needed.

In this study, an online survey was designed by the authors and completed by international engineering graduate students in order to evaluate the influential factors to choose a school and other factors to affecting their overall educational experience. Results were compiled and interpreted to evaluate the performance of US institutions in their efforts to provide better learning environments for international graduate engineering students. These results can be further enhanced in future by conducting a survey of US institution for efforts made over the years to recruit and enhance the educational experience of international graduate students. In the next two sections, survey design and survey findings in detail have been presented and the last section provides conclusions.

Survey Design

Authors designed an online survey with several questions related to international graduate engineering graduate students and alumni. Demographic information was collected such that the results could be split into responses from current graduate students and responses from alumni who had graduated from US institutions. This survey was approved by the Institutional Review Board (IRB) at Mississippi State University, when all of the authors were employed there. Respondents were able to respond anonymously because no identifying information was requested. The survey was voluntary and participants could exit out at any time. Invitations asked only international graduate students and alumni at US universities to respond. There were 1180 students and alumni taking the survey from STEM fields at US schools recruited via contacting student organizations, administrative offices, and colleagues. Among them, 518 were current students and 112 were alumni at an US university from an engineering background. Students were from different nationalities including Africa, Asia, Australia and Pacific Islands, Europe / Russia (but not Scandinavia), Middle East, North America (Canada and Mexico), and South America. The actual number of invited respondents and the response rate was not known, as the respondents were not directly contacted following IRB guidelines. Survey data was collected during 2008-2009.

Survey Findings

Survey data was analyzed using Microsoft Excel due to the ease of analysis and interpretation. Further complex statistical analysis is planned using commercial tools. Specific questions relevant to scope of the present study are discussed in this section. Results are presented in column graphs and radar graphs to better visualize the data.

Specific questions addressed here are preferences adopted in choosing a graduate school, graduate student challenges, safety and security of campus, funding availability, information for Curricular Practical Training, and graduate school expectations. These responses from current students were contrasted to alumni responses. The survey findings presented here are based only on the engineering student subpopulation of the respondents.

Influential factors in choosing a school:

In this section of the online survey, respondents were asked to rank the set of possible factors that most influenced their decision to apply to a particular university with 1 as greatest influence and 10 as little or no influence. Below were the options given to survey respondents:

1. University recruitment effort
2. Correspondence with graduate school/professors before arrival
3. Funding opportunities
4. Ranking of the school
5. International student population
6. Location of university
7. Quality of faculty members
8. Employment prospects after graduation
9. Overall expenses
10. Having friends or someone you knew

Ranking of these factors were averaged and ordered in MS Excel to correlate a high ranking number with more important and smaller number for less important. Figure 1 shows the influential factors of the survey respondents. Both alumni and current students ranked funding opportunities as the top factor influencing their decision. University ranking, university recruitment efforts, and quality of faculty were more important to current students, while alumni gave importance to having friends or someone they knew at specific university. However, it should be noted that these responses all differ by less than 5%.

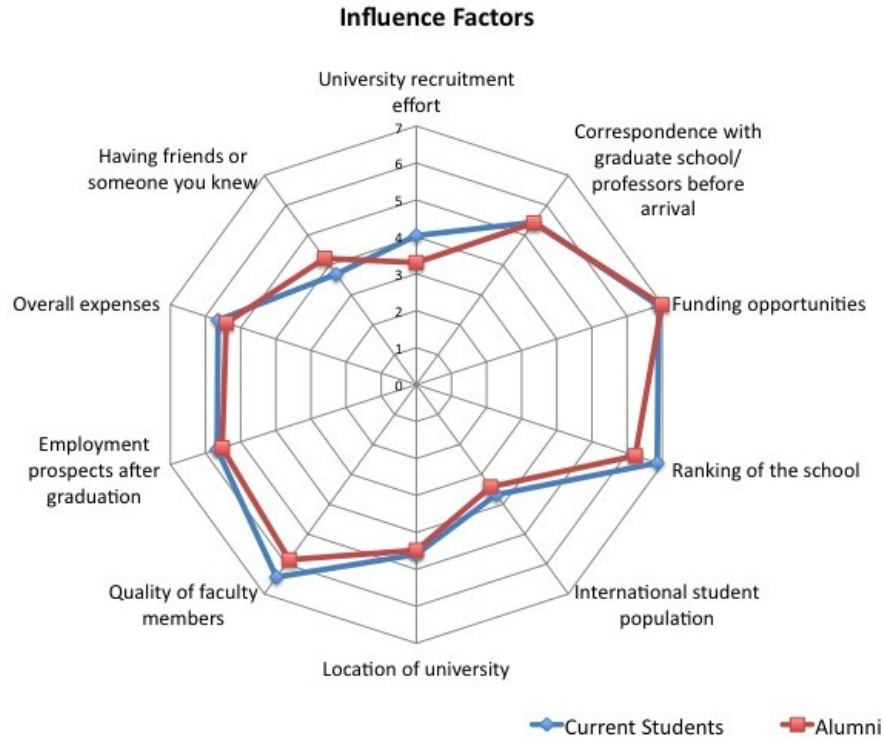


Figure 1: Influential factors for choosing a school. The importance of factors influencing student choices remained similar for current and students and alumni.

Graduate studies challenges:

In this section, survey respondents were asked to rank the challenging phases they experienced during their graduate studies. Multiple responses were provided for this particular question as students or alumni could have had more than one difficult phase during graduate studies. They were also given the option to add additional challenging factors they experienced during their studies at US universities. There were five different options to be selected from

1. Admission
2. Getting VISA
3. In school
4. I did not have difficult phase
5. Other (Please specify)

Figure 2, shows the respondent’s ratings of difficult phases during graduate studies. The most difficult phase for both current students and alumni was ‘in school (coursework, funding, adjusting with culture, etc)’. Alumni ranked securing job after graduation as equally difficult to this. As shown in graph, ‘obtaining a job after graduation’ was one of the most difficult phases chosen by alumni, as this option was not provided to current students.

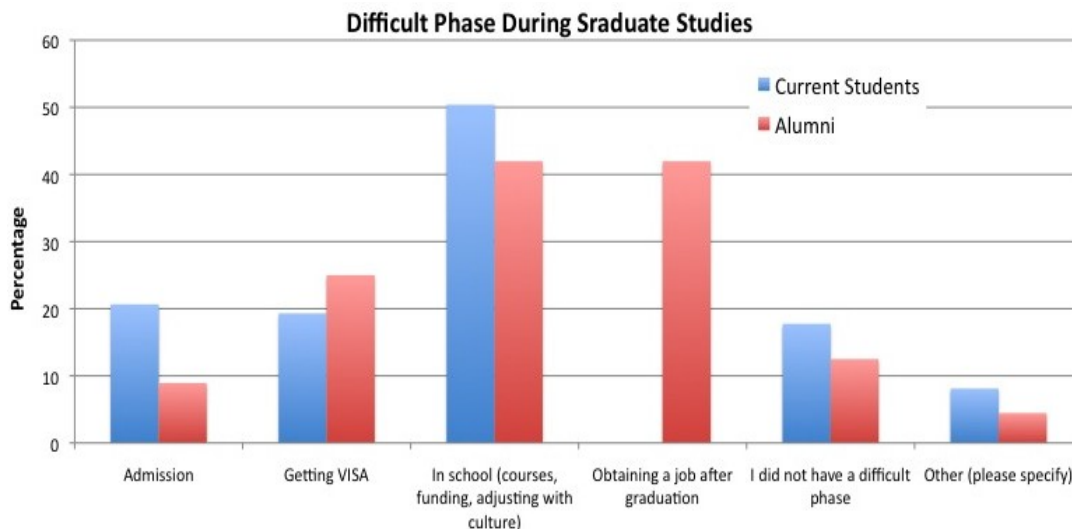


Figure 2: Difficult phases during graduate studies experienced by students. Most difficult phase for both current students and alumni was ‘in school’ and obtaining a job after graduation was not a part of the survey questionnaire for current students.

Safety and Security of campus:

This survey also inquired how satisfied the students were regarding safety and security of campus. Figure 3 shows that more than 40% of current students and alumni population were very satisfied with another ~25-30% extremely satisfied with the safety and security provided in the campus where they went to graduate school. Less than 5% of both current and alumni were not satisfied. There were more alumni who were extremely satisfied with safety and security provided compared to current students.

Funding support from school:

Respondents were asked when they obtained funding support from their host institution. They were provided with following options. Since funding was one of the highest ranked criteria students used to choose a school, this is an area where institutional efforts will have the greatest impact. Here are the options given to respondents:

1. Before arriving in the US
2. Within the first semester
3. After first semester
4. After first year
5. Still looking for support
6. Never tried

In this survey, information on the timing of funding support was also obtained. Comparisons were made between alumni and current students with regards to the six response options provided. As shown in figure 4, about 50% of the current students obtained funding

before they arrived in US, which was about 10% higher than what alumni received. On the other side, there was a significant population of alumni (20%), who never received funding in their research career.

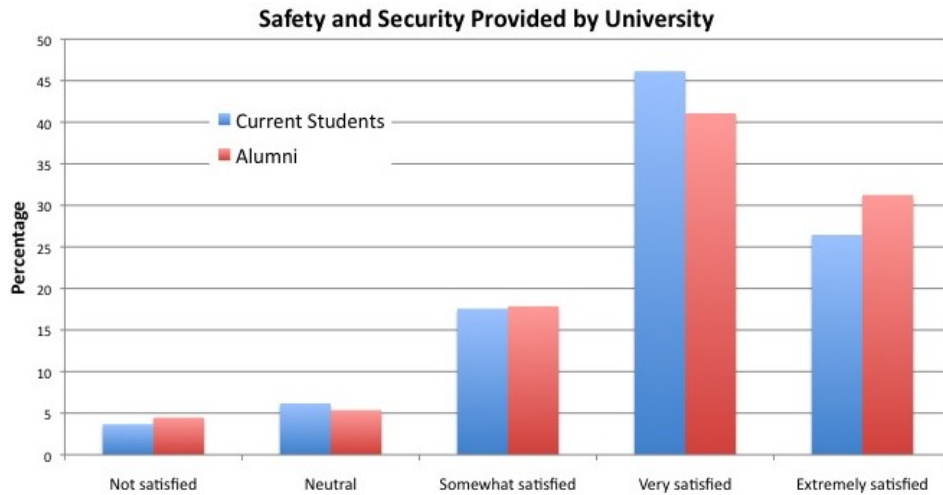


Figure 3: Campus safety and security. Both current students and alumni were very satisfied with the safety and security. More alumni responded with ‘extremely satisfied’ compared to current students.

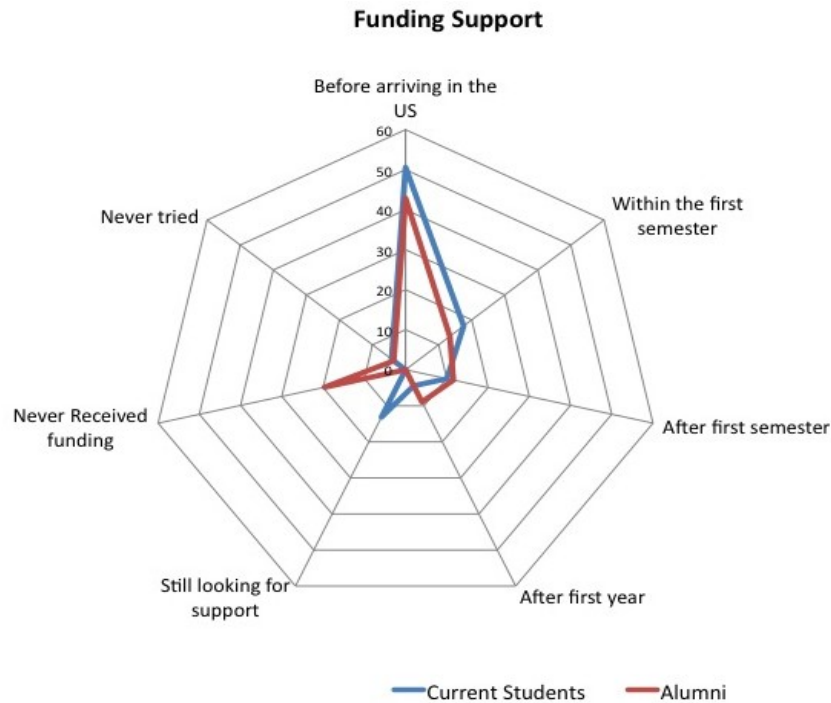


Figure 4: Timing of the funding support obtained during their education at US University. About 50% of the current students obtain funding support from the university before their

arrival. About 20% of alumni never obtained funding during their graduate study and had to self-support themselves.

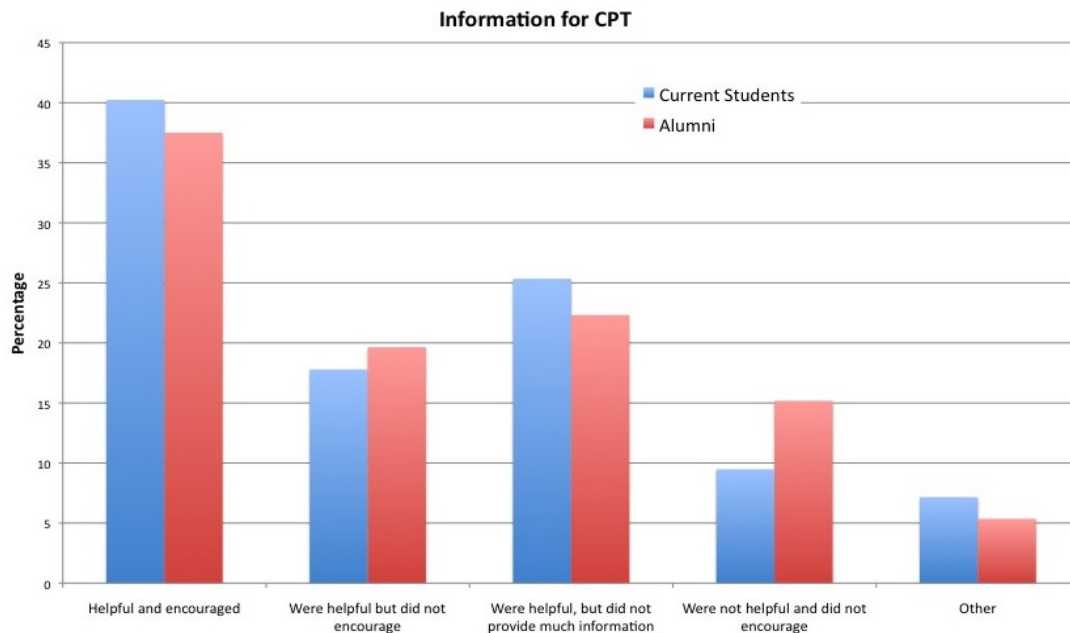


Figure 5: Information or training provided by the school to pursue CPT. ~40% of the current students found the information given by the school as helpful and were also encouraged to pursue CPT. About 20% of the alumni students were neither encouraged to apply for CPT, nor enough information were provided to them

Information for CPT or internship:

In this question, respondents were asked: “Did your university encourage / provide information to facilitate Curricular Practical Training (CPT) or Internship?” The following options were provided:

1. Helpful and encouraged
2. Were helpful, but did not provide much information
3. Were helpful but did not encourage
4. Were not helpful and did not encourage
5. Other

From figure 5, a comparison between alumni and current students were made to confirm how much support was given by the university to opt for curricular practical training. Current students were comparatively more satisfied by the information and encouragement provided to them for applying to CPT. This shows preparedness of current students to search for job in their home country or host country is almost similar or a little better than alumni.

Graduate school expectations:

This survey questionnaire inquires if the student's expectations were met after joining graduate school. The options for this question were:

1. Exceeded expectations,
2. Very good,
3. Good,
4. Fair
5. Poor

As shown in figure 6, more than 60% of alumni respondents felt very good or better about their choice of school whereas the percentage of current students responding very good or better was around 40%. This shows that current students either have higher expectations compared to alumni or alumni look back more fondly on their education than students do who are currently enrolled in it.

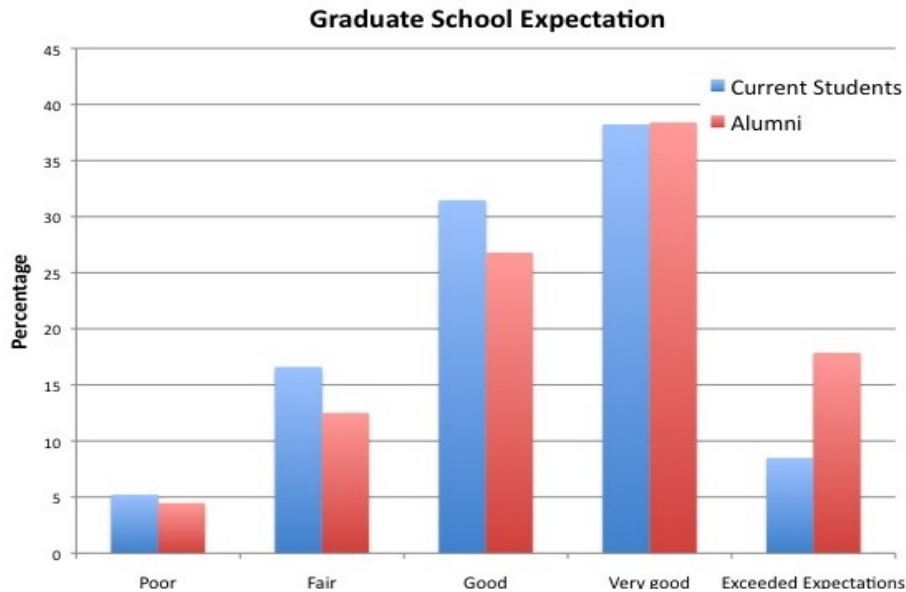


Figure 6: Graduate school expectations. More than 15% of the alumni population found that their choice of school exceeded expectations.

Student expectations of their higher educational institution include:

1. Quality of curriculum and course contents,
2. Quality of faculty members,
3. Help provided by different administrative organizations,
4. Safety / security of campus,
5. Preparedness to take a job and getting other timely support.

Educational institutes make efforts in this direction to provide better educational experience for students. Results presented in this study indicate that most of the recruitment efforts made by US institutions are in right direction have increased, although possibly it can be

concluded results also indicate that the expectations and needs of students are growing continuously. Recruitment efforts can be directed towards enhancing the educational experience and towards attracting better quality graduate students and being top nation to attract international students. The results presented here also show suggest the need of for a more detailed survey of students to identify specific needs and expectations of current students. The current survey can also help educational institutions to identify efforts made towards key areas, which provides better educational experiences for international students.

Conclusions

This paper discusses the difference in perceptions of alumni and current international graduate students at US universities. Their response to survey were contrasted for specific questions related to influential factors to choose a school, challenges faced by graduate students, funding support, safety and security as well as graduate school satisfaction. Comparison of current students' experiences with past alumni experience did provide insight into past efforts by US institutions to provide better educational experiences. Both alumni and current students ranked funding opportunities as the top factor influencing their decision to choose a school and ranked other factors to choose a school very similarly. The most difficult graduate school phase for both current students and alumni was 'in school'. About 50% of the current students obtained funding before they arrived in U.S., which was about 10% higher than what alumni received. More than 60% of alumni respondents felt very good or better about their choice of school whereas the percentage of current students responding very good or better was around 40%. Survey findings show that US institutions have been making progress in their efforts by providing enhanced funding, comparable safety/ security, and providing information to better prepare students for post-graduation jobs. Results also shows possible increased expectations and changing needs of international graduate students.

This study is focused on certain important aspects and will be expanded in future with more research questions, and enhanced analysis. Results also identify a need of detailed survey to find reasons of increased expectations and needs of current international graduate students compared to alumni. A survey of US educational institutes for efforts in direction of providing better educational experience will provide further insight.

References

1. Soumya Keshavamurthy, Anurag Srivastava, Adrienne Minerick, and Noel Schulz, "Challenges for international students in a globally changing environment", Proceedings of the 2008 ASEE Annual Conference and Exposition, Pittsburgh, 2008.
2. D. M. Peterson, P. Briggs, L. Dreasher, D. D. Horner, and T. Nelson, "Contributions of International Students and Programs to Campus Diversity", *New Directions for Student Services*, vol. 86, 1999.
3. H. O. Yurtseven, "How does the image of engineering affect student recruitment and retention? A perspective from the USA", *Global Journal of Engineering Education*, vol. 6, no. 1, pp. 17–23, 2002.
4. Linda K. Lau, "Institutional Factors Affecting Student Retention", *Education*, vol. 124, 2003.

5. Cathy A. Enz, Leo M. Renaghan and A. Neal Geller, "Graduate-Level Education: A Survey of Stakeholders", *The Cornell Hotel and Restaurant Administration Quarterly*, vol. 34, no. 4, pp. 90-95, August 1993.
6. Gillian N. Saunders-Smits, "Engineering Heroes Wanted: The Importance of Alumni", SEFI 2009 Annual Conference.
7. Alberto F. Cabrera, David J. Weerts, Bradford J. Zulick, "Making An Impact With Alumni Surveys", *New Directions For Institutional Research*, No. 126, Summer 2005
8. G. V. Davidson-Shivers, Kit Inpornjivit, Kim Sellers, "Using Alumni and Student Databases for Program Evaluation and Planning" *College Student Journal*, vol. 38, 2004
9. J. McGourty, M. Besterfield-Sacre, L.J. Shuman, H. Wolfe, "Improving academic programs by capitalizing on alumni's perceptions and experiences", 29th Annual Frontiers in Education Conference, 1999, San Juan, Puerto Rico.
10. Karen W. Bauer, Joan S. Bennett, "Alumni Perceptions Used to Assess Undergraduate Research Experience", *Journal of Higher Education*, vol. 74, 2003.
11. Sara Carter and Elaine Collinson, "Entrepreneurship education: Alumni perceptions of the role of higher education institutions", *Journal of Small Business and Enterprise Development*, vol. 6, No. 3, 1999.
12. Edward Gehringer, "Understanding and relating to your international students", *American Society for Engineering Education*, 2008.
13. Sunny Marche, "Professional Development Needs of Graduate Students: Comparing and Contrasting Perspectives", ASAC, 2008, Halifax, Nova Scotia.
14. T. J. Jackson, "Bolstering Graduate School Enrollments Through Effective Use of Alumni", *College and University*, vol. 60, no. 3, pp. 210-218, 1985.
15. Andrea G. Trice and Jin Eun Yoo, "International graduate students' perceptions of their academic experience", *Journal of Research in International Education*, vol. 6, no. 41, 2007.
16. Soumya K Srivastava, Anurag Srivastava, Adrienne Minerick, and Noel Schulz, "International graduate students' challenges: a survey-based study", *Proceedings of the ASEE Annual Conference and Exposition*, 2009.