Industry Needs/University Offering Gap

This document is a compilation of data and information sources relevant to a potential gap between programs and courses offered by the UH ECE Department and industry needs. This compilation should not be considered comprehensive but is rather a sampling of what is available. A summary of conclusions and recommendations is expected by the summer of 2016.

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Chris Brantley is the Managing Director of IEEE USA. Scott Grayson works for him.

From: **Scott Grayson** <s.grayson@ieee.org>
Date: Fri, Jan 15, 2016 at 6:32 PM
Subject: Re: Any information on the following that we might share with members
To: Chris Brantley <c.brantley@ieee.org>
Cc: Mary Ward-Callan <m.ward-callan@ieee.org>, Karen Hawkins <k.hawkins@ieee.org>

We do not have stats on this but our Employment and Career Services Committee has held a few roundtable discussion/symposia over the years to get at this question. Several years ago we

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organized three panels with a moderator at Texas A&M. One panel consisted of faculty, the next panel was industry leaders working in Energy related fields. The last panel was a combination of the two groups. The purpose was to understand Future Engineering Skills and where the gaps were. We believe each discipline and area of technology will have its own set of challenges.

Most industry members stated that engineering schools are not preparing or teaching students what they need to know. Other industry leaders made the same statement but said it doesn't matter because we will teach them what they need to know when they come and work here but they have to have good technical skills, be able to work in teams and across all disciplines. Faculty and University Administrators admitted that they are aware there is a gap but faculty has tenure and when they try to get them to change their curricula to accommodate industry needs they won't. It was pretty astounding to hear this said out loud. I think we all know this is happening. We are planning to conduct a few more of these to try to gather data and help find solutions.

I have attached a committee document that goes into greater detail.

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IEEE-Advancing Technology for Humanity
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Report of IEEE Employment and Career Services Committee

4/11/2015

Why a Future Engineering Skills Symposium in your area

The **Future Engineering Skills Symposia** program was initiated several years back by the Employment and Career Services Committee of IEEE-USA to provide timely and useful information and services to enable members to maintain life-long, satisfying careers. At the same time engineering students, graduating engineers, as well as young engineering professionals expressed the need for better information on the trends in industry's need for engineers going forward five, ten, and possibly fifteen years.

The committee felt this to be a very important task of IEEE and IEEE USA for US engineers, particularly if the data contained information about which engineering skills, of the many comprising electrical engineering and computer engineering, would be most in demand.

After conducting several Future Engineering Skills Symposia, the committee found that the process of collecting the information was as valuable as the information itself. The participants, especially the undergraduate and postgraduate students, the faculty, and industry became very interested in the

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comments by various companies, and the consensus that developed during the open roundtable discussions.

Several trends began to develop distinguishing between basic science and math skills, specialized electrical engineering knowledge, business and financial understanding, and last but not least "soft skills". Soft skills included those needed to work in a flat organization, such as the ability to get things done without formal authority, and the skills that improve team efficiency and decision-making.

Comments by midcareer engineers participating as observers gave IEEE USA better understanding of the obstacles both external and self-imposed encountered when trying to make the major career changes needed by engineers coming from technical fields no longer in demand by industry.

The group determined that better results are obtained when industry participants are from similar industry sectors so that the technical skills deemed to be required in the future fall within a narrower band.

The format that yielded the best results was one where the University or College sponsored the symposium, and the local student section, young professionals groups, and the local IEEE section worked together to make it happen. Industry participation is m most effective if the invitations come from the University or College, and the local IEEE section.

To summarize, Future Engineering Skill Symposia findings, and the interaction between industry, academia, students (undergraduates and postgraduates), early career engineers, and mid-career engineers faced with major changes, provide a very valuable tool for all participants to chart their future actions and strategies so that there will be a reasonable match between what is taught, career decisions, and industry needs.

Summary of Benefits

- For the College or University

    o Dialog with industry about needed skills
    o Interaction with students on future skills
    o Faculty collaboration with multiple specialty fields
    o Input for curriculum and/or projects
    o Information for students and graduates for career planning
    o Support for and from local IEEE and IEEE-USA members

- For IEEE-USA

    o Forum for understanding skills needed for engineering careers
    o Dialog with industry on needed skills
    o Strengthening relationships with universities
    o Engaging students in exploring career options
    o Leveraging information from forum for young professionals and mid-career engineers

- For Industry

    o Dialog with universities on current skills available from graduates vs. skills needed in the future that may affect ongoing curricula

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- o Exposure to highly motivated students
- o Strengthening relationships with university
- o Dialog with peers on skills needed for continued success

End of Committee Report
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On Fri, Jan 15, 2016 at 5:13 PM, Chris Brantley <c.brantley@ieee.org> wrote:
Hi Mary,

I've copied Scott in case he may be aware of any, but I would offer my perspective that this is a big problem in the U.S. because the only data regularly collected relates to hires and salary offers, and not skills/hiring match. Companies love to talk about the "skills gap" but are not very forthcoming in publicly sharing hiring priorities in terms of needed skills. Instead, they will complain about overall preparation of students, especially in terms of soft skills and ability to contribute (e.g. teams, leadership, etc.)..but offer little generic guidance to universities in terms of technical skill gaps.

Anyway.. there is some serious discussion of gaps on this topic here and there. Usually it relates to shortages of graduates in new/emerging and multidisciplinary fields, as well as in previously dormant fields that have gotten hot again (i.e., where universities have cut back on programs/seats/faculty, so they're not able to ramp up quickly to meet the accelerating demand. Power was in this latter category a couple years back, and nuclear before that.

Indian
perspective: http://www.universityworldnews.com/article.php?story=20140204171742828

NAE Bridge article on industry needs and engineering curricula - by Rick Stephens (former Boeing HR)
http://www.nae.edu/Publications/Bridge/81221/81233.aspx

and related articles in that issue:
 http://www.nae.edu/Publications/Bridge/ReformingEngineeringEducation.aspx

NAE The Engineer of 2020 study: http://www.nae.edu/Publications/Reports/25876.aspx

ASEE on transforming undergraduate engineering education
https://www.asee.org/TUEE_PhaseI_WorkshopReport.pdf

Entrepreneurship as a gap: https://www.government.nl/topics/entrepreneurship-and-innovation/contents/closing-the-gap-between-education-and-industry

Industry-University collaboration on curricula design as a solution:

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(IBM and Murray State):
http://www.wsj.com/articles/SB10001424052702303847804579481500497963552
http://opensiuc.lib.siu.edu/cgi/viewcontent.cgi?article=1111&context=ojwed
https://www.asee.org/documents/conferences/international/2008/ASEE-GCEE-CT-Oct-2008-Lueny-Morell.pdf

Gaps in the Computer Science Curriculum:
http://lakishasimmons.com/images/publications/simmons_curriculum.pdf

Not sure any of this gets to what you're looking for...but if so..let me know what's useful and I'll find you more.

Chris B.

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More links suggested by IEEE

http://nist.gov/mep/upload/Bridging-the-Skills-Gap_2012.pdf

http://www.tech-collective.org/index.php?option=com_news_items&task=viewNews&pk_news_itemsID=4086

https://www.act.org/research/policymakers/pdf/abettermeasure.pdf

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Article referred by Collabratec: Inside Higher Education

https://www.insidehighered.com/news/2015/01/20/study-finds-big-gaps-between-student-and-employer-perceptions

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Email from Doug detailing industry trends and used by IEEE Publications Services and Products Board for long range planning.

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Doug Verret <dougverret@gmail.com>   Jan 5

to Len, Alan

Here an item I found in the IEEE archives after a cursory search. It is an excerpt from the Publication Services and Products Board Long Range Strategy. It is a synthesis of data collected by Tecker Consultants LLC.
Doug

Demographic, Social and Consumer Values
1.Globally, the population of engineers and other technology professionals will grow over the next 15 years.
2. The largest percentage growth of TP will be outside of North America and Western Europe Post secondary educated.
3. There will be a growing commoditization of technical professionals globally.
4. The average length of a 'technical career' will be diminishing, which will increase need for continuing education to prepare people for mid-career job shifts.
5. The need for and interest in technical information will increase dramatically.

Legislative and Regulatory Issues
1.Funding agencies and government might mandate open access.
2. There is likely to be increased legislation to promote "green" policies.
3. In the area of international copyright and patent protection, we will likely see more activity, and multinational corporations will seek to strengthen IP and patent regulations.
4. There may be more restrictive legislation and regulatory activity (like OFAC and ITAR) that prevents export of information.
5. In the area of cross-border recognition of professional qualifications and credentials; there will likely be some regulations related to this issue.

Global Economic Climate
1. There will be increased emphasis on conserving natural resources and on developing renewable (and "green") energy sources as alternatives to oil and coal.
2. There will be a continuing shift of world influence from present developed nations to developing nations.
3. There will be a continuing "flattening" of the world as the internet allows people to be easily connected around the globe to conduct business. This will be especially true in areas of information and knowledge access which will influence business and

education competitiveness.
4. Centers of technology excellence will spread across the flat world.
5. Wars and conflict will affect global economics (inflation risk, etc.).

Future of the Profession
1. There will be a greater disconnect between individuals and employers.
2. Engineering will continue to become more interdisciplinary.
3. Employers will expect immediate value contribution.
4.Engineering solutions will be broadly identified, collaboratively resolved and locally applied.
5. Changing age demographics will pose a threat of knowledge loss as the "baby boom" generation's more experienced professionals retires. There will be a need to identify gaps in practical knowledge in transfer from one generation to the next.

Science and Technological Advances
1. A smart, inter-communicating, personal, portable device will be commonplace and ubiquitous.
2. Current boundaries between various disciplines, including science and technology will be less distinguishable.
3. There will be greater activity in biological systems and interaction with engineering.
4. Environmentally-sound technologies will be a driver or major component in future advances.
5. Increased computing power, bandwidth, and miniaturization will influence the technology for information access and dissemination.

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