Creating the World of 2025

FEATURES

Future Nanoelectronic Technologies: Overcoming Semiconductor Limits

Problem Solving: Engineers as Leaders

Offshoring and the U.S. Electrical Engineering Workforce: Impacts and Trends

Globalization and Its Impact on Electrical and Computer Education: Preparing Engineers for the World of 2025

www.hkn.org
Dear fellow HKN members,

Robert M. Janossik took on the persona of the HKN executive director in autum 2004, when the International Engineering Consortium (IEC) assumed responsibility for managing HKN. Bob brought a tremendous amount of personal energy and creativity to instill a new vitality into HKN as the society entered its second century. Sadly, Bob passed away January 29. Bob’s impact is visibly evident in the new look and fresh content of THE BRIDGE and in the new HKN Web site. Less visible, but perhaps more important, Bob worked diligently to improve our operations and governance. He will be greatly missed.

I am pleased to announce that Roger Plummer, executive vice president of the IEC, has been appointed as the executive director of HKN, succeeding Bob Janossik. Roger will be closely supported by Dr. Barry Sullivan, IEC director of Content Development and a member of HKN, and the entire IEC professional staff.

Roger Plummer graduated from the University of Illinois in 1984 with an engineering degree. He then joined Illinois Bell Telephone Company as a management trainee and continued with Illinois Bell and its successor company, Ameritech, for 30 years. During that period, Roger worked in various engineering, operations, and marketing assignments, rising to level of vice president. He retired from his position as president and chief executive officer of Ameritech Custom Business Services in 1994. Shortly after retiring, he joined the IEC as managing director. In that role, Roger worked very closely with Bob Janossik in all of the IEC’s endeavors. I am confident that Roger will be an enthusiastic leader and diligent manager of the HKN affairs.

Roger can be reached at executive@hkn.org.

Warm regards,

Karl E. Martensiek

LETTER FROM THE EDITOR

Barry J. Sullivan | Beta Omicron Chapter Member

This issue of THE BRIDGE marks the second with the new look and format, and my first as the editor. It was my pleasure and privilege to work under the direction of Bob Janossik on the last issue. In my new role, I will strive to maintain the high standard he set as we continue to evolve THE BRIDGE to meet your needs and expectations.

The autumn 2001 issue of THE BRIDGE explored “The World of 2025,” presenting visions: articles on the state of technology 20 years into the future. In this issue, we build on that theme by considering some of the challenges engineers will face in “Creating the World of 2025.”

Stephen Goodnick provides guidance for the semiconductor road map as he describes the challenges of engineering at the nanoscale in his article, “Future Nanoelectronic Technologies.” Ron Hira offers guidance on where in the world this work will take place as he addresses “Fashioning the U.S. Electrical Engineering Workforce: Impacts and Trends.”

Training the next generation of engineers must take into account changes in the nature of engineering careers as well as the advance of technology. In their article, “Globalization and Its Impact on Electrical and Computer Education,” Kenneth Conner and Kenneth Jokisch report on a recent workshop on these issues organized by the Electrical and Computer Engineering Department Heads Association (ECDEH).

Finally, achieving the vision of technology in 2025 will require visionary leadership. Steven Sample, recently named an HKN Eminent Member, presents the case for engineers assuming leadership roles in his article, “Problem Solving: Engineers as Leaders.”

You will find supplemental material for these articles on the Eta Kappa Nu Web site, www.hkn.org. While you are there, I encourage you to help us serve you better by sharing your e-mail address if you have not done so already. You can do this by following the “Update Your Information” link on the home page.

I hope you enjoy this issue of THE BRIDGE. I welcome your suggestions for new themes and additional improvements as we plan for future issues. I can be reached at editor@hkn.org.

Warm regards,

Barry J. Sullivan

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Eta Kappa Nu (HKN) was founded by Maurice L. Carn at the University of Illinois on October 28, 1912, to encourage excellence in education for the benefit of the public. HKN continues today by recognizing students and professionals who have contributed to the advancement of engineering education through distinguished scholarship, activities, leadership, and exemplary character as teachers in electrical or computer engineering or by their professional attainments.

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Impacts and Trends

Many companies are transferring tasks and jobs traditionally done by American engineers to lower-cost countries. What will be the impact on engineers and the engineering profession? What can the individual engineer do to adapt to this trend?

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Engineering education must adapt to changes in the profession as well. How should ECE educators in the United States react to this global situation? What should they do to better prepare students for working in a global industry?

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Future Nanoelectronic Technologies Overcoming Semiconductor Limits

by Stephen M. Goodnick

The dominant technology in the semiconductor industry over the past several decades has been the metal oxide semiconductor field-effect transistor (MOSFET). The gate length, which corresponds to the distance between the source and drain, is the critical dimension that affects performance. As this length is reduced, all the corresponding dimensions of the device decrease in size or "scale," according to well-defined scaling rules from the International Technology Roadmap of Semiconductors (ITRS).

![Figure 1](https://example.com/figure1.png)

Figure 1: Scaling of Successive Generations of MOSFETs into the Nanoscale Regime (from ITRS, with permission)

![Figure 2](https://example.com/figure2.png)

Figure 2: A Molecular "Junction" (Left) and details of the Organic Chain with Metal Contacts (Above)

Today there is increasing interest in the use of self-assembled, chemically grown wire structures in future IET-type devices using carbon nanotubes (CNTs) and self-assembled semiconductor NWs. CNTs are the focus of considerable attention because of the many remarkable properties of this new structured state of carbon. It is a highly stable state of matter, very similar in concept to fullerenes like C60 (buckyballs). There is also intense interest in semiconductor NWs because of the demonstration of directed self-assembly of NWs via epitaxial growth. The scalability of arrays of such NWs and NTS to circuits and architectures has also begun to be addressed, although the primary difficulty is in the ability to grow and control NWs and CNTs with desired location and direction.

Beyond these material and manufacturing issues, there are fundamental limits as device dimensions shrink. One is that quantum mechanics start to play a role in small dimensions, in terms of the wave-like properties of charge carriers such as electrons.

For more on this topic, visit [www.hkn.org/bridge](http://www.hkn.org/bridge)

ABOUT THE AUTHOR

Stephen M. Goodnick

Interim Dean of Engineering, Director of Nanoelectronics, Arizona State University

Delia Pi Chapter – Oregon State University

A leading researcher in the emerging field of nanoelectronics, Dr. Goodnick also studies transport in semiconductor devices, computational electronics, and high frequency and optical devices. He joined Arizona State in 1996 as chair of the Department of Electrical Engineering. Prior to that, he was a professor of electrical and computer engineering at Iowa State University. He is a past president of the IEEE Solid State Circuits Conference and a member of the National Academy of Engineering. He was named a Fellow of the IEEE in 2004.
Second Century Project

The HKN Board invited all chapters to participate in the Second Century Project to help determine the future direction of the organization. In phase one of the project, completed earlier this year, chapters met in brainstorming sessions to gather ideas in response to five questions on the purpose of HKN and the activities it supports. These ideas are now being evaluated in a survey of all current student members as phase two of the project.

The results of the Second Century Project will provide structured input to the HKN Board on the future direction of HKN. Participation in the project will help chapters meet the requisite criteria to be considered for the Outstanding Chapter Award.

Regional Leadership Conference

Beta Chapter will host a student leadership conference at Purdue University in November 2006. The conference will feature industry executives and distinguished alumni speaking on the leadership qualities that have contributed to their success. Students attending the conference will also participate in activities to develop their leadership skills. This conference will serve as a model for other regional conferences, providing opportunities for students to meet and network with members from other universities as they gain valuable training.

Faculty Advisor Honor Roll

The honor roll recognition is given to advisors who participate in at least four general membership activities and one officer training or planning executive committee activity, who submit an Annual Faculty Advisor Report, and who receive letters of recommendation from the chapter president and the host department chair. Also, the chapters must initiate members during the year and submit all required chapter reports. This program is administered by the Faculty Advisor Support Committee, and the next application through the Annual Faculty Advisors Report is due June 30 for the 2005-2006 academic year.

HKN Chapter Activities

Every year, HKN chapters submit an annual report describing their various activities. In addition to serving as a basis for selecting the Outstanding Chapters listed on page 16 of this issue, these reports catalog the valuable services active chapters deliver to students, departments, universities, and the surrounding communities. HKN chapter activities demonstrate that Eta Kappa Nu is more than an honor society. In addition to recognizing deserving students, it is dedicated to serving the electrical and computer engineering profession as well as society as a whole. Some of the chapter activities that provided important services and instilled personal pride in HKN members over the past year include the following:

1. Awards recognizing outstanding professors and students
2. Tutoring services, including peer advising, study sessions, and exam files
3. Fundraising through sponsorship and merchandise sales
4. Scholarships funded and awarded
5. Career planning through information sessions and job databases
6. Engineering open house and career days
7. Faculty and course evaluations
8. Research and industry seminars
9. Department service projects
10. Community service projects
11. Social activities
Offshoring and the U.S. Electrical Engineering Workforce

Impacts and Trends

by Ron Hira*

The net effects of offshoring on the U.S. economy are uncertain, but engineers and the engineering community can begin adapting if they understand the anticipated impacts on the labor market and begin tracking observable trends. This information can also help policymakers explore feasible policy responses.

Impacts of Offshoring on Employment

Most economists believe that offshoring will have little or no long-term impact on the overall number of jobs or the unemployment rates in the United States. According to their models, the total number of jobs in the United States is a function of the size of the labor force (primarily influenced by population and labor force participation), and the unemployment rate is a function of monetary and fiscal policies. They argue that individual jobs may indeed disappear at the microeconomic level as they are moved overseas, but the displaced workers will find jobs elsewhere in the economy as new opportunities arise or are created.

In the short term, offshoring is expected to have the following impacts on employment: job displacement for U.S. workers; a change in the mix of U.S. occupations; and decreased pressures on wages for jobs that are newly tradable across borders.

> Job Displacement

Some U.S. workers will lose their jobs as their work is shifted to overseas locations. In July 2005, for example, Wachovia Corporation announced plans to move many of its information technology (IT) jobs to India and told its 5,000 U.S. IT workers to prepare for layoffs. The assumption is that those about-to-be displaced workers will be re-employed rapidly, and at substantially the same wages, as they “adjust,” in economics say, to structural changes in the economy.

For displaced engineers, the adjustment process depends on the robustness of engineering job creation. In Figure 1 shows, U.S. electrical and electronics engineers and computer scientists experienced higher levels of unemployment in the past four years than during any other four-year period since 1972.

In 2003, for the first time, the unemployment rate for electrical and electronics engineers (6.2 percent) exceeded the national unemployment rate (6 percent). To put this in historical perspective, throughout the 1980s, unemployment among electrical and electronics engineering never rose above 2 percent, despite national unemployment rates that peaked at 9.7 percent.

In addition, because of the slack labor market, wages of those who are employed fell slightly. For the first time in 55 years that the Institute of Electrical and Electronics Engineers–USA has been surveying its members, median compensation declined in 2003. Although unemployment rates improved markedly among electrical and electronics engineers in 2004, this was partly due to increased hiring and partly due to engineers dropping out of the profession and looking for work in other occupations.

> Mix of U.S. Occupations

The second effect of offshoring predicted by economists is a change in the mix of U.S. occupations, in some jobs migrate to more efficient (lower-cost) overseas locations. As some sectors are lost, the United States will specialize in sectors in which it has a comparative advantage. However, there is no guarantee that the new mix of U.S. occupations will be better. In fact, economists cannot predict what types of new jobs will be created. This is a key policy question that no one can answer at this point. It is also a practical question. In every IEEE meeting I attend, I am invariably asked, “What new jobs should I be training for? What new skill sets will I need?”

Education is grappling with the same questions. Engineering educators want to adjust curricula to help immerse their students’ careers against offshoring. But because most companies are reluctant to reveal their plans for offshoring, and because the government is not collecting data, we are left to speculate about what kinds of jobs will go and what kinds will stay.

If the United States relinquishes many engineering and technology jobs, will we be able to replace them with better jobs? If the replacements are non–technology jobs, how will that affect our ability to drive technological innovation? Convincing economic theories do not explicitly account for the impact of offshoring on technological innovation and national security.

> Wage Suppression

The third predicted effect on employment is wage suppression in jobs that are newly tradable across borders. Workers in these occupations are suddenly facing much more competition, which means they have less bargaining power. As some try to shift into non-tradable tasks in the same or new occupations, competition for these jobs will also increase. Some observers believe that wage suppression, rather than job loss per se, will be the most important effect of offshoring on U.S. employment.

Conclusion

It is clear that offshoring will have a major impact on many engineers and the engineering profession. Engineers need not be diligent about tracking these trends so that they can adapt to them and ensure they have durable careers. It is unlikely the government will help, and some of the proposals promoted by companies, such as doubling the number of American engineering graduates, may actually hurt. For the working engineer, it is ever more important to network with others in your profession and to take charge of managing your career.

ABOUT THE AUTHOR

Ron Hira
Assistant Professor, Public Policy, Rochester Institute of Technology

Dr. Hira specializes in engineering workforce issues and technology policy. He is the author of Outsourcing America, has testified before the U.S. Congress on the implications of offshoring outsourcing, and has given more than 70 invited talks on this subject. Dr. Hira is a licensed professional engineer and is vice president of Career Activities of IEEE-USA. In 2004, he was awarded the Citation of Honor from IEEE-USA for his work on behalf of the engineering profession.
Globalization and Its Impact on Electrical and Computer Education
Preparing Engineers for the World of 2025

by Kenneth Connor and Kenneth Jenkins

It is difficult to predict the changing nature of the engineering workplace in the 21st century, but some trends are becoming apparent. In November 2005, the Electrical and Computer Engineering Department Heads Association (ECEDA) held a workshop on the Impact of Globalization on ECE Programs of the Future, for which we invited several leaders of the industry, government, and academia to address about 90 ECE department heads. We heard certain common themes, especially from the industrial participants. First, employment for electrical engineers, computer engineers, and computer scientists remains strong. Starting salaries do not suggest either a shortage or excess of engineers, but we continue to attract about 25,000 engineers from foreign countries each year. It is also important to note that more and more jobs are being rehired with U.S. citizens, which clearly affects the graduates of U.S. universities and limits the ability of companies to fill positions from abroad. While engineering students can expect to see a good job market, the nature of the jobs is changing, because companies are changing.

For more than a decade, companies have been moving from the multirational model to the global model. Previously, companies tended to create more or less self-contained units at each location, at least in part because it was difficult for their people to work together effectively if separated by significant distance. However, with the revolution in collaboration tools and communication channels made possible by the Internet and ubiquitous computing, it is now possible for a group working together on some project to be scattered throughout several sites in several countries. This means that it is no longer necessary to duplicate capabilities.

Rather, each unit in a company can have unique strengths that can be exploited by all other units. Regardless of whether such unique units are in other countries, they will have many characteristics that differ greatly from unit to unit.

Because of the development of the global rather than multinational company, all participants at the workshop, as well as most industry people we talk to, stress very strongly that engineers now must be able to do their job without ever being in the same room with their collaborators. This puts a very high premium on communication skills, because the cultures at different locations can be very different even if they are not in different countries. To achieve the highest level of success in such a new working environment, it is necessary to be able to utilize all new collaboration tools, which are changing at least as fast as any other engineering product.

These changes are occurring, albeit in different ways, in all kinds of companies. Most of us have read stories of how the largest companies such as IBM and GE have units throughout the world. However, nearly all companies now have business units in many states and countries. Even defense contractors such as BAE Systems, Lockheed Martin, and SAIC are in hundreds of cities worldwide. Issues of security and export controls can significantly limit the flow of information, but design teams are not generally located at one site. Smaller and even start-up companies are also increasingly spread out.

One strategy is to properly prepare students to work across hierarchical levels of design. Composite skills are the key to success, so training students with the ability to work across many levels will become increasingly valuable. Coupled with this will be the need for increased emphasis on multidisciplinary skills. Engineers who can work effectively with colleagues from several disciplines and respond to a rapidly changing work environment will be most likely to succeed.

In addition, it is still perceived that one of the main assets of the United States' engineering workforce is its entrepreneurial culture. Educational programs should seek to capitalize on and foster entrepreneurship in molding engineers for the future.

To meet the challenges of a quickly changing global marketplace for engineers, ECE programs should feature both breadth and depth via hands-on projects initiated in the first year. A systems engineering approach that deals properly with real constraints (e.g., cost, environmental issues, etc.) should be introduced early, and efforts should be made to achieve integration across courses, effective management of project teams, and innovation.

In anticipation of U.S. engineers moving to higher-value-added job functions in global organizations, it is important to emphasize what are often called "soft skills" from areas such as communication, leadership, culture, history, and language of other societies, along with ethics and values. Additional content should be included in ECE curricula that covers topics such as business awareness and skills, an understanding of company organization and management, economics, offshoring versus globalization, and entrepreneurship.

Conclusion

The concepts of "design at a distance" (working in teams across the country and/or world), the ability to quickly expand into non-traditional ECE disciplines (bio, etc.), and adaptability to change (hiring teaching as a mechanism to retain hiring employment) must all be woven into a successful program. It is also important that U.S. universities develop partnerships with non-U.S. academic, industrial, and government institutions, including for collaborative research and design projects and substantially increased opportunities for study and work-abroad experiences.

For more on this topic, visit www.hkn.org/bridge

The theme of the 2006 ECEDA Annual Meeting is Globalization Opportunities for EICE. This meeting plays a critical role in our plan to address globalization, since it will help to involve the majority of ECE department heads. Details of the 2006 ECEDA Annual Meeting can be found on the ECEDA web site, www.eceda.org.

ABOUT THE AUTHORS

Kenneth A. Connor
ECEDA President; Department Chair, Electrical, Computer, and Systems Engineering, Rensselaer Polytechnic Institute
Theta chapter – University of Wisconsin

Dr. Connor conducts research on plasma diagnostics and electromagnetic phenomena, in addition to technology-enhanced learning. He joined the Rensselaer faculty in 1974. He was named a Fellow of the IEEE in 1998 for his work on the application of heavy particle beam-based diagnostics to plasma of interest to the thermonuclear fusion community.

Kenneth Jenkins
ECEDA Past President; Department Head, Electrical Engineering, The Pennsylvania State University
Chi chapter – Lehigh University

Dr. Jenkins’ research interests include signal processing algorithms, multidimensional array processing, and biological-inspired algorithms for signal processing. He co-authored a book on Advanced Concepts in Adaptive Signal Processing. He is a Fellow of the IEEE and the recipient of a Golden Jubilee Medal from the IEEE Consultants and Systems Society and a 2006 Millennium Award from the IEEE.
Three New Eminent Members Inducted

Eta Kappa Nu established the rank of Eminent Member in 1950 as the society's highest membership classification. It is conferred upon those select few whose contributions and attainments in the field of electrical and computer engineering have resulted in significant benefits to humankind.

EMINENT MEMBER  Presented March 2006

Jack St. Clair Kilby

There are few men whose insights and professional accomplishments have changed the world. Jack Kilby is one of these men. During the summer of 1958, working with borrowed and improvised equipment, he conceived and built the first electronic circuit in which all of the components were fabricated in a single piece of semiconductor material. It was this breakthrough that made possible the sophisticated high-speed computer and large-capacity semiconductor memories of today's information age. Mr. Kilby went on to pioneer military, industrial, and commercial applications of microchip technology. He later co-invented both the handheld calculator and the thermal printer that was used in portable data terminals. From Mr. Kilby's first simple circuit has grown a worldwide integrated circuit market whose sales in 2004 totaled $176 billion. These components supported a 2004 worldwide electronic end-equipment market of $1.18 trillion. Such is the power of one idea to change the world.

* Photo courtesy of IT

EMINENT MEMBER  Presented October 2005

Steven B. Sample

Dr. Sample became the 10th president of USC in March 1991. The university's first holder of the Robert C. Packard President's Chair, Dr. Sample is also an electrical engineer, a musician, an outdoorsman, a best-selling author, and an inventor. Sample is the author of numerous journal articles and published papers in science and engineering and higher education. His patents in digital appliance controls have been licensed to practically every major manufacturer of appliance controls and microwave ovens in the world. More than 300 million home appliance have been built using his inventions. He remains an active member of USC's faculty, co-teaching a popular course for juniors and seniors titled "The Art and Adventure of Leadership." His book, The Conqueror's Guide to Leadership, has been a Los Angeles Times bestseller and has been translated into five languages. He donates all royalties to a scholarship fund for USC undergraduates.

EMINENT MEMBER  Presented January 2006

Andrew J. Viterbi

Anyone using a cell phone today has almost certainly benefited from one of the technologies developed by Andrew Viterbi. He is the inventor of the Viterbi algorithm, an algorithm used for decoding convolutionally encoded data. He also contributed significantly to developing CDMA for wireless communications and eugenizing the technology throughout the world. His inventions are used in the vast majority of digital wireless phones, data terminals, and digital satellite broadcast systems, as well as in such diverse applications as magnetic recording, speech recognition, and DNA sequence analysis. Viterbi is a co-founder and retired chairman and chief technical officer of QUALCOMM. He spent equal portions of his career in industry, having previously co-founded Linkabit Corporation, and in academia, as a professor at UCLA and then at USC, where he was one professor emeritus. He is president of the Viterbi Group, a technical advisory and investment company.

Kilby at a Glance

> Invented the integrated circuit at Texas Instruments; rose to assistant vice president and director of engineering and technology. Components group
> Distinguished professor of electrical engineering, Texas A&M University
> B.S. in electrical engineering, University of Illinois, and M.S. in electrical engineering, University of Wisconsin

Sample at a Glance

> President of the University of Southern California
> Former president of the State University of New York at Buffalo
> Elected to the National Academy of Engineering in 1998 and the American Academy of Arts and Sciences in 2003
> Member, Alpha chapter
> B.S., M.S., and Ph.D. from the University of Illinois at Urbana-Champaign

Viterbi at a Glance

> Trustee and presidential chair professor, University of Southern California
> President of the Viterbi Group
> Co-founder of Linkabit and QUALCOMM
> National Academy of Engineering, National Academy of Science, and the American Academy of Arts and Sciences
> Member, Beta Theta chapter
> B.S. and M.S. in electrical engineering from Massachusetts Institute of Technology (MIT), and Ph.D. in digital communications from the University of Southern California

HKN Distinguished Service Award

Awarding esteemed recognition to at most one individual annually, the Distinguished Service Award honors those who have made significant contributions to the HKN society throughout their lifetime.

AWARD WINNER  Presented December 2005

David G. Meyer

David Meyer has served HKN where it matters most—at the local chapter level. As a professor of electrical and computer engineering at Purdue University, he has served as HKN faculty advisor for the Beta Chapter since 1986. During this time, the chapter has received HKN's Outstanding Chapter Award numerous times. Meyer guided the chapter to activities that improved professional development, raised instructional and institutional standards, encouraged scholarship and creativity, provided public service, and furthered the established goals of HKN. In addition to his dedication to his local chapter, in 1989 he was elected to the HKN Board of Governors and later served as vice president and president. As an officer, Dr. Meyer spent considerable time encouraging chapters to become responsive to various HKN efforts, in particular by encouraging comments on proposed changes to the organization's constitution.

Meyer at a Glance

> Professor of electrical and computer engineering, Purdue University
> HKN faculty advisor for the Beta Chapter at Purdue
> HKN C. Horace MacDonald Outstanding Teacher Award
> Member, Beta chapter
> B.S., M.S., and Ph.D. from Purdue University

www.hkn.org
Problem Solving: Engineers as Leaders
The Art of Leadership from the Perspective of an Engineer

by Steven B. Sample

made us a better leader. It's a way to remind them that leaders come from all types of disciplines and backgrounds. In other words, the path to political leadership is not necessarily through law school, nor is business school the only route to becoming a company president.

In fact, 30 or 40 years ago, the doors were closed to engineers who wanted to be presidents of comprehensive universities. Today, among the 62 members of the Association of American Universities (which comprises America's leading research universities), 10 are led by engineers (including USC).

What lessons can be learned in engineering that can contribute to a person's effectiveness as a leader? At the top of the list would be analytical thinking and judgment—key attributes of the engineering profession. These qualities can help leaders examine problems from various angles and assess situations through qualitative and quantitative means.

Often the most important inventions in a particular field are made by people who are new to that field—people who are too naïve to know why something can't be done. These neophytes, unbowed by conventional perspectives and limited by their training, are able to think more freely about seemingly intractable problems. They're willing to explore radically new ideas and technologies.

Unfortunately, some engineers feel threatened by new inventions. When I was a practicing engineer, I quickly found out that many of my colleagues, after just a few years in practice at one company and in one technology, become psychologically and emotionally wedded to that technology.

Just consider this: At one time, the leading vacuum tube manufacturer was RCA. Then the transistor was invented. One would think that RCA, as the dominating force in the electronics business, would have latched onto the transistor as a new technology that could take their business to greater heights of success. However, the engineers at RCA hated the concept of the transistor. So Texas Instruments became the rising star of the transistor industry. And although an engineer at Texas Instruments later invented the integrated circuit, most of the engineers at TI had spent their whole lives with transistors and didn't want to have anything to do with integrated circuits. Another firm—Intel—became dominant in that field.

Although hindsight thinking can be flattering, moral laxity can be downright dangerous. Leaders must develop a strong moral compass if they are to be effective leaders. Even the perception that a leader is dishonest, unfair, or unconcerned about the rights of other people can adversely affect the success of a company or organization.

The downside of engineering as preparation for leadership occurs when engineers become so entrenched in a particular technology or methodology that they stop exploring new ideas. They lapse into rigid thinking that can stifle their own creativity and that of others. In addition, engineers—whose work directly affects people—sometimes gloss over the importance of moral considerations in the design and creation of new products or processes.

I'm an engineer by education and a leader by experience. Both are problem-solving professions that have dissimilar roots. Engineering employs the application of well-defined and long-lasting mathematical, scientific, and technical principles, while leadership is remarkably fluid, situational, and contingent. Unlike the specificity of math and science, leadership has no set rules. This elusive quality of leadership makes it an art, not a science. Thus it is more like music, painting, and poetry than it is a routine endeavor. Nonetheless, aspiring leaders can be taught to develop their own potential for leadership by studying what's worked for others.

As part of my own study of leadership, management expert Warren Bennis and I co-teach a course for juniors and seniors each spring called "The Art and Adventure of Leadership." It is now the most sought-after course at the University of Southern California, attracting more than 500 applications for just 40 slots.

Although most of the students in this leadership class aren't engineering majors, I often tell them how the study of engineering has

USC President Steven B. Sample (left), here co-teaching "The Art and Adventure of Leadership" with renowned USC management expert Warren Bennis

For more on this topic, visit

www.hkn.org/bridge

ABOUT THE AUTHOR

Steven B. Sample
President, University of Southern California
Alpha chapter—University of Illinois

An electrical engineer, inventor, and author of the best-selling book "The Engineer's Guide to Leadership," Sample has been president of the University of Southern California since 1991. A recent publication of the Harvard Business School Press was his book as one of six "must-reads" for leaders. In February 1998, he was elected to the National Academy of Engineering for his contributions to consumer electronics and leadership in interdisciplinary research and education. He was named an Environ Member ofEta Kappa Nu in October 2001.
HKN Awards at ECEDHA Annual Meeting

The Outstanding Electrical and Computer Engineering Student Award and the Outstanding Chapter Awards were presented at a banquet during the annual meeting of the Electrical and Computer Engineering Department Heads Association (ECEDHA) at the Turtle Bay Resort on Oahu's beautiful north shore on March 13, 2006.

Outstanding Electrical and Computer Engineering Student Award 2005

The Allen E. Zerby and Carl T. Korrer Outstanding Electrical and Computer Engineering Student Award recognizes outstanding scholastic excellence and high moral character, coupled with demonstrated exemplary service to classmates, university, community, and country. This program is administered by the Los Angeles Area Alumni Chapter. A jury of distinguished engineers selects the recipient. For more on the award and a list of past winners, visit www.hkn.org/awards/seces.html

2005 AWARD RECIPIENT

Blaine Murakami, University of Hawaii

Murakami has co-authored one book chapter and 13 conference papers, in addition to serving as the student principal investigator on a $100,000 grant to design and build two nanosatellites for low Earth orbit. He also co-founded a company to develop self-cleaning antenna technology, of which he is a co-inventor.

Honorable Mention — Outstanding Electrical and Computer Engineering Student Award 2005

Ayush Goyal
Boise State University

Lai Heung Fan Thiven
University of California Los Angeles

Jacquelyn Kay Strible
University of Missouri Rolla

Outstanding Chapter Awards 2005

The Outstanding Chapter Award recognizes excellence in college chapters for their activities. Recent changes in the award allow multiple winners and level the playing field for large and small chapters to be recognized for commendable performance. For more on the award and a list of past winners, visit www.hkn.org/awards/octs.html

2005 CHAPTER AWARD RECIPIENTS

Department heads from seven of the nine Outstanding Chapters were on hand to accept the award on behalf of their chapters. From left to right:

Robert Trew, North Carolina State University, Beta Eta Chapter
Richard Bluhut, University of Illinois at Urbana-Champaign, Alpha Chapter
Mark Smith, Purdue University, Beta Chapter
David Munson, University of Michigan, Beta Epsilon Chuckar
Jacquelyn Strible & Kelvin Erickson, University of Missouri-Rolla, Gamma Theta Chapter
Ali Sayed, University of California, Los Angeles, Iota Gamma Chapter
Gary May, Georgia Institute of Technology, Beta Mu Chapter
Karl Martensbeck, HKN President
David Irwin, HKN Vice President

ADDITIONAL CHAPTER AWARD RECIPIENTS (Not Pictured)

University of California, Berkeley, Chi Chapter
Florida International University, Kappa Delta Chapter

Dear Eta Kappa Nu Members and Friends,

Our contributions campaign for 2005–06 has produced more than $25,000 thus far, but there is still time for members to support the work of the association. Nearly 400 members have contributed already, enabling progress on new HKN initiatives.

This letter appears in the second issue of a revitalized THE BRIEFCASE magazine, just one example of these initiatives. The format and content of the magazine have received very positive feedback from members. Beta Chapter will host a student leadership conference at Purdue University in November—the first of many such conferences and another important initiative. The new HKN Web site (www.hkn.org) has become a valuable resource for members and for those considering membership.

Your gifts have helped fund implementation and continuation of these very important initiatives.

Please consider joining those listed on the following pages to make the 2005–06 campaign a big success. The greater level of support and additional services that HKN needs to provide can only be accomplished by the support of its loyal members and friends. Please help HKN achieve greater service levels to its students, professional members, and society. Your contribution can be sent to Kathy Rickel, HKN administrative director, at:

HKN Headquarters
300 West Adams, Suite 1210
Chicago, Illinois 60606-5114, USA

In conclusion, I am honored to be executive director of this very special organization whose initial chapter was formed at my alma mater, the University of Illinois at Urbana-Champaign. While your financial support will be very important to the work of HKN, your active involvement in the work of the chapters and HKN as a whole is just as valued. Your ideas on how we can strengthen our programs and grow membership will always be welcome. Send your ideas to me at executive@hkn.org.

I look forward to working with you.

Warmest personal regards,

Roger Plemmer
Executive Director
Eta Kappa Nu

Roger Blomquist
Executive Director
Eta Kappa Nu
2005–2006 Annual Fund Contributors

Eta Kappa Nu thanks its many generous donors who have contributed to the 2005–2006 Annual Campaign. As EKN enters its second century of service, it is renewing its important service mission through many notable improvements in university-chapter relations, student member leadership development, bounteous volunteer support, working relationships with ECE department chairs, and improved communications including an updated Web site, a newly formatted magazine, and e-mail communication with members.

$1,000 & Higher

John Diver
Bruce C. Fesmire
J. David Irvine
Robert M. Janowiak
Alan Lefloe
Karl Martineck
Roger L. Plummer
Casimir Skreczak

$500 to $999

Malcolm Carriere
North Holakman
Frederick Herke
Simon Ramo
Joanne L. Waitte

$250 to $499

Joseph Bonfiglia
Geoff Johns
Teresa Olson
Murray Patkin

$100 to $249

Gerald Almora
Milan Amorosa
Analog Devices
Kathryn Anderson
Sara Archipenski
Robert Arherst
Walter Gordon Aerts
James Balane
Richard Barber
Douglas Bliss
Suzanne Branigan
B.J. Bohman
Angelika Bosley
David Burke
Charles Gouppe
Frederic Chambefin
Ogil Clapson
James Coddle
Kathryn Cundill
Joel Oynes
Jerry Daniels
Mark Daniels
Yadin Dai
Darco De Mio

$50 to $99

Lyle Amos
J. Lynne Anderson
Jon Azriel
Maria Bohr
N. Anshen Ball
George B. Barnes
Ronald Brinkman
Timotheo Brooks
David Burns
Richard Caise
Dominick Conte
Leo Dehner
Bruce Allen Douglas
James Dion
Kenneth Fonda
Otto Foster
Edward Hamilton
Robert Hattwick
Howard Hoot
Michael Ipputi
Jonathan James
Kelly Jones
Carl Jung
Roger Kelley
James Koyta
John Kost
Milton Koh
Bee Bee Law
John L.C. Lau
David L. Lock
S.S. Li
John Lippens
George Lyman
Alan Mantooth
Ralph A. MacKellent
Mark Mehdij
Carl Miller
Matthew Moore
Kevin Moser
J. Mudron
Arnold Nol
Frank Peteche
Paris Poulos
Richard Raymond
Charles Robe
James Rogers
Michael Sagon
Peter Sebin
Sasa Sito
Thomas Shook
David Skaler

$25 to $49

J. N. Anderson
William Anderson
William Banks
Michael Bicher
James Bicher
Martin Besner
Jennie Black
William Boucher
Donald Bouchard
Emile Bouchard
Jennifer Bowen
J.C. Bracken
Merril Buckner
Carl Carlson
James Chernenko
Philip Beem
Michael Behn
Vincent John Bemasi
Leonard Dimitrilli
Donald Dauthaie
Tom Perry
Thomas Fitzhugh
Far Fauchier
Victor Green
Herman Houck
Wayne Harrell
Eugene Henry
Joseph Jakubowski
Ray Kemper
Herbert Kliger
Peter Kline
Andrew Koen
Frank Labauce
Robert Lapinnos
Martha Lazzi
Charli Lau
Dina Letrict
Louis Maccio
Alan McLaughlin
James Moore
Robert Moore
William Murray
Thomas Munson
Thomas Newmon
David Norskowski
R.L. Nolf
Michael Oles
Gerald Otten
Herbert Ross
John Riley
Charles Roth
Tony Salas
James Schofield
Glen Sheehan
Brian Schroeder
Edwin Stoep
John Sigmund
Robert Simpsson
Burton E. Stevenson
Samuel Shell

Under $25

Ray E. Aker
Jeremy Bloom
Alan Beren
Lawrence Chiu
John C. Cole
John Dugatko
Gary O'Neary
Alfred Deutsch
William Donaldson
Christina Eggert
David Forsworth
Wendy Flet
Kornel Fischer
Edward Friedman
Raymond Halber
Barbara Hall
Donald D. Hareb
Kenneth Helmert
Harold Hoeschen
Douglas Hopkins
Alex Kendall
Vito Laplaca
D. Lieberman
Dr. Magnan
Thomas Mark
Amiezeta
Ronald Mann
Jeffrey Speyer
Daniel Rice
Jordan Rosenthal
Mark Simpson
William Stamm
Bodrusi Sarmay
Thomas Taylor
Larry Vogel

www.hkn.org
The HKN Web Site

Professional Look and Feel
The HKN Web site sports an industry-accepted site architecture and layout with a professional design that is easy to navigate and understand.

Better Site and Page Architecture
The site is easier to comprehend with much of the content reworked and regrouped.

Easy-to-Use Navigation and Organization
The HKN site features a pull-down navigation menu, which allows quick, easy, and direct access to all of the site's main sections and pages.

HKN News Features
HKN members can now stay up to date on the latest society activities by visiting the HKN Web site. The site's home page features news headlines that link to articles and press releases.

HKN Video Testimonials
The HKN Web site features video testimonials from HKN alumni exploring the benefits of membership in the society.

Chapter Administration Forms and Information
Everything needed to establish and run an HKN chapter is now available in one spot on the HKN Web site.