AC 2008-332: DEPARTMENTAL SURVIVAL THROUGH COLLABORATIVE INDUSTRIAL PARTNERSHIP

Jaby Mohammed, Morehead State University
Jaby Mohammed received his B.S. in Mechanical Engineering from University of Kerala, India in 1997; he received his MBA with specialization in Operations Management in 2001, his M.S. with a concentration in Industrial Engineering from University of Louisville in 2002, and has a PhD in Industrial engineering from University of Louisville in 2006. His research interest includes advanced manufacturing; computer aided design, six sigma, and enterprise resource planning. He is a member of IIE, ASQ, SME, POMS, ITEA, NAIT, KAS,and Informs.

Sam Mason, Morehead State University
Mr. Sam Mason, CMfgT, CSIT is an instructor of Industrial and Engineering Technology in the areas of Manufacturing/Robotics and Graphics Technology. He has a Master of Science in Industrial Technology and currently pursuing an Educational Doctoral degree in Instructional Systems Design for curriculum and instruction. His industrial work background ranges from supervision, quality, manufacturing and automation engineering and instructional training. He is Chairman – Elect for the Lexington, KY Society of Manufacturing Engineers chapter and on the State Project Lead the Way Certification Team

Xiaolong Li, Morehead State University
Xiaolong Li joined Morehead State University in 2006, after graduation from The University of Cincinnati with a Ph.D. degree in Electrical and Computer Engineering. He earned his Bachelor of Engineering and Master of Engineering degrees in Electrical and Information Engineering from Huazhong University of Science and Technology, Wuhan, China, in 1999 and 2002, respectively. Dr. Li teaches Computer Networking, Microprocessor, Computer Electronics, and Wireless Communications. Dr. Li's current research interest is in the area of wireless and mobile networking, especially in wireless ad hoc and sensor networks.

Departmental Survival through Collaborative Industrial Partnership

Abstract

In this paper/discussion the author's identify how the Industrial and Engineering technology curriculum and program strengthened at Morehead State University. The author's initially review a brief history of the Industrial and Engineering Technology program and how the department survived from closing down to become one of the most successful departments at the university.

The author's also describe how the objectives were set and how department worked with the local industrial partners and advisors to set up and help with the curriculum to meet the industrial demands.   The objectives were set based on the local educational and industrial demands for the employment, research and educational collaboration with in the university service region, and the Commonwealth.

The paper would then conclude that successful industry-education collaboration is characterized by feelings of mutual ownership and commitment among the faculty, students, department advisors, and the local industries. The evidence of the accomplishments between the department and the industry will be discussed using a model of the relationship and analysis of cooperative education and employee evaluation of the students.

Introduction

The mere thought of stagnation during a century of change is grounds for extinction, not only for business but also education. Survival mode sets in when the threat of elimination appears to knock at the door. This survivalism is triggered by anticipation of disruptions in local, regional or global social or political order and the movement toward preparation to survive. Does this mean education needs to worry? Does it mean that only certain programs of education need to worry?

The Industrial and Engineering Technology department at Morehead State University has continued to survive for the past 85 years of its natural and unnatural existence. This paper would speak of existence as unnatural as if it were artificial. In not so many terms, it was and is currently.   The departments' existence needed to be inventive; inconsistent with the natural pattern or custom assigned during its mere development. It needed to break down barriers of the perceived "social norm" to survive.

History

Morehead State University began its journey in 1887 as the Morehead Christian Normal School and was known as "a light to the mountains" [4].   Its mission was to bring education, enlightenment and hope to those of the mountainous region and became a public institution in 1922 (MSU, 2007). During this time, the development of the Industrial Arts program began as a support program to prepare teachers to fill positions in the vocational training programs as result of the Smith-Hughes Act of 1917 [9]. Twenty years later, during WWII, the campus was in

danger of closing for duration of time due to low enrollment. College President William Vaughn and Dean Warren Lappin returned from a visit from a northern Michigan College that opened a Navy training facility on their campus. With determination to survive and a trip to Washington, D.C. the campus hosted 4,400 Navy Bluejacket sailors (600 at a time) to become trained as shipboard electricians in what was known as the U.S. Navy Training School [3].

President Theodore Roosevelt addressed congress in 1907 and urged major school reform that would provide industrial education in urban centers and agricultural education in rural areas [10]. Fortunately, Morehead State College with the establishment of the U.S. Navy Training School in electricity and its rural agrarian area, the vocational education program could prosper in both urban and rural directions. Once academic achievement was tracked and programs sifted children into different career pathways, academics and manual labor (vocational) trades became a topic of heavy debate. In efforts to improve image and steer away from the debate, the department had its first name change in the 1960's to the Department of Industrial Education and Technology.

Factor evaluation for enrollment decline

Annual birth rates in the United States peaked their highest numbers during 1954 thru 1963 [7], which will become vital to enrollment numbers during the late 70's and early 80's. The enrollment for the IET department during the 1960's began to increase, especially in Industrial Education as the biggest program, due to post war economy and close recessions during the years of 1953 through 1961 [12] thus justifying necessity again until the Vietnam War Conflict. "Part-time enrollment typically increases during times of economic recession, when unemployment rates are high. When good jobs are scarce, many Americans opt for college as a way to improve their odds of landing a good job when market conditions improve" [2].

Over the next decade, improving image was vital for survival. The Industrial Education and Technology (IET, from the 2004 IET was changed to Industrial and Engineering Technology) department developed over 30 different associate level degrees in technical fields such as heating, air conditioning, and ventilation (HVAC), welding, automotive, broadcast technology, drafting, electricity and mining reclamation. This development strictly follows Franklin Bobbitt's ideas of 1924. Development of education and curriculum should be similar to ideas of efficiency making its way through American industry and way of life. Schools should teach what is immediately and tangibly useful as determined by surveying society itself [6]. These degree programs were primarily coupled with in-house, first through third shift, programs with industry such as Rockwell Automation, A.O. Smith and Browning (Emerson Power Transmission) and expanded as far north as Northern Kentucky below Cincinnati, OH. With 21 faculty, the IET department grew to an average student enrollment of 750 throughout the 1970's and continued growth to the mid 800 average throughout the 1980's (E.G. Nass, 41 year IET faculty, personal communication, September 29, 2007).

The Bachelor of Science degree list was considerably shorter with a few technology degrees coupled with vocational education and Masters level degrees in principalship and supervision. Majority of the students were non-traditional parents seeking the next level with the Associates degree for a particular technical area. This attempt was to accommodate the large enrollment

numbers in the department, brought on by the steady growth of annual birth rates during the mid 50's through the mid 60's. Not only were the birth rates a contributor but also the recessions from 1969, 1970 and 1973 through 1975.

By the late 1980's, IET faculty numbers dropped nearly 50% and the list of 30 AAS degrees had been reduced to only nine (9) and the Bachelor of Science degree involved three degrees: Industrial Education, Industrial Technology and Mining and Reclamation Energy Studies. Modification of program curriculum again was a direct result of a sharp decline in unemployment rate and an eight (8) year span between recessions as seen in the figure below from the U.S. Department of Labor.

Courtesy of U.S. Depatment of Labor: Bureau of Labor Statistics Data

Figure 1: Unemployment rate

Those of enrollment eligibility within and outside the MSU IET service region of Eastern Kentucky may have followed Dortch's analysis that would-be students opted to earn rather than learn (1997). As the unemployment rate continued to drop and the economy offered more job opportunities, the enrollment numbers continued to drop in the department to dangerously low numbers compared to the past three decades. Beginning in 1991, the Mining and Reclamation Energy Studies program was eliminated due to the decline in the coal boom of Eastern Kentucky. According to Smith-Mello and Schirmer, from 1990-1992, Kentucky coal mines had a reduction of 58% from 1,769 to 752 and surface and strip mine operations fell 71% from 943 to 270 (1994).

Due to a steady decline in enrollment in the early 1990's, expensive laboratories, highly specialized faculty and continued association with vocational education, the IET program was pinpointed by the University for possible program elimination. The faculty was placed into, yet, another situation to make a major change in program curriculum or face the dismantling process. The early 90's restructuring resulted in one Associate degree in Industrial Technology with four

technical option areas: Construction/ Mining, Electrical/Electronics, Graphic Communications and Manufacturing/Robotics. The result also included two Bachelor of Science degrees: Industrial Technology (with same five options as the Associate degree) and Industrial Education.

Yet, once again despite the radical change and small increases in enrollment, the scrutiny of university administration brought another ultimatum to the department; simply put, justify your existence. The plans were to dismantle the department and place some courses under the Department of Physics and the rest under the College of Business. The faculty, up to this point, had created course curriculum based on economic and society needs of industry and technical areas. Now they needed not only look for course ideas but recruit and establish outside support to maintain existence. The department had close affiliations with industry through cooperative education programs, consulting and previous training/educational opportunities in-house but never established a partnership involving industry to the next level.

Departmental survival techniques

In 1997, the IET department, with the assistance of local and regional business and industry leaders, created an Advisory Board. The Advisory Board was developed to create a partnership for direction, insight, career placement and provide a voice of support for IET throughout the community to university administration. This led to the ability of accreditation from an outside agency, NAIT. The National Association of Industrial Technology is the premier agency accrediting industrial technology programs in colleges, universities, and technical institutes. They promote industrial technology in business, industry, education, and government and recognize professional development by certifying industrial technologists (NAIT, 2007).

With this movement, the most dramatic transformation of the department began to take place in the shortest amount of time throughout its existence. In 1998, the IET department became the 43rd university to be accredited with schools such as Purdue, Texas A&M, Ohio University and the only accredited program in Kentucky. The Advisory Board and NAIT outside voices objectively approached the university administration, outlining strengths and weaknesses of the department and mandated improvements to reach and maintain strict standards for quality.

Changes also began with changing the vocational image to a more modernistic one with a name change for the Master degree program. The Master of Vocational Education was changed to the Master of Career and Technical Education and with the enrollment increase, the department developed an industry based Master of Industrial Technology. During this survival to maintain course enrollments, cross listing similar courses became necessary to keep courses from being closed to students needing them to graduate.

In 2002, the department was up for re-accreditation through NAIT. With the strict enforcement for and maintaining quality, the university and department worked diligently to upgrade software, equipment and curriculum and passed the recertification process. In 2004, a new Industrial Technology option was developed, Telecommunications and Computer Technology. This option has developed into collaboration with the Space Science program at MSU sharing faculty and students for continued growth and success. In 2005, the department and the collaboration of the Advisory Board saw an increased need for students that had an ACT score

too low to be accepted into a pure engineering program or the engineering curriculum wasn't the right fit for them, so the creation of an Engineering Technology program was developed. The advisory board stressed industry needed engineers that could solve problems on the production floor, not only by a mental approach but also physically. This program gave those students opportunity to excel in higher level math courses, chemistry, physics and computer programming plus utilizing those strengths with a hands-on emphasized laboratory.

In order to continue growth and show flexibility, in 2006, the department was approved and launched a Technology Management Completer program. This totally online program was focused toward a seamless transfer of course material between MSU and community colleges. The program was developed primarily for the Kentucky Community and Technical College System (KCTCS) but has been expanded to include Sinclair Community College in Dayton, OH with the possibility of others and is beginning to show growth. During the past five year's department had undergone a major change to full fill the needs of the service region. new programs were developed for traditional and non-traditional students including online programs. Figure 2 shows the various programs that had been developed in the recent years.

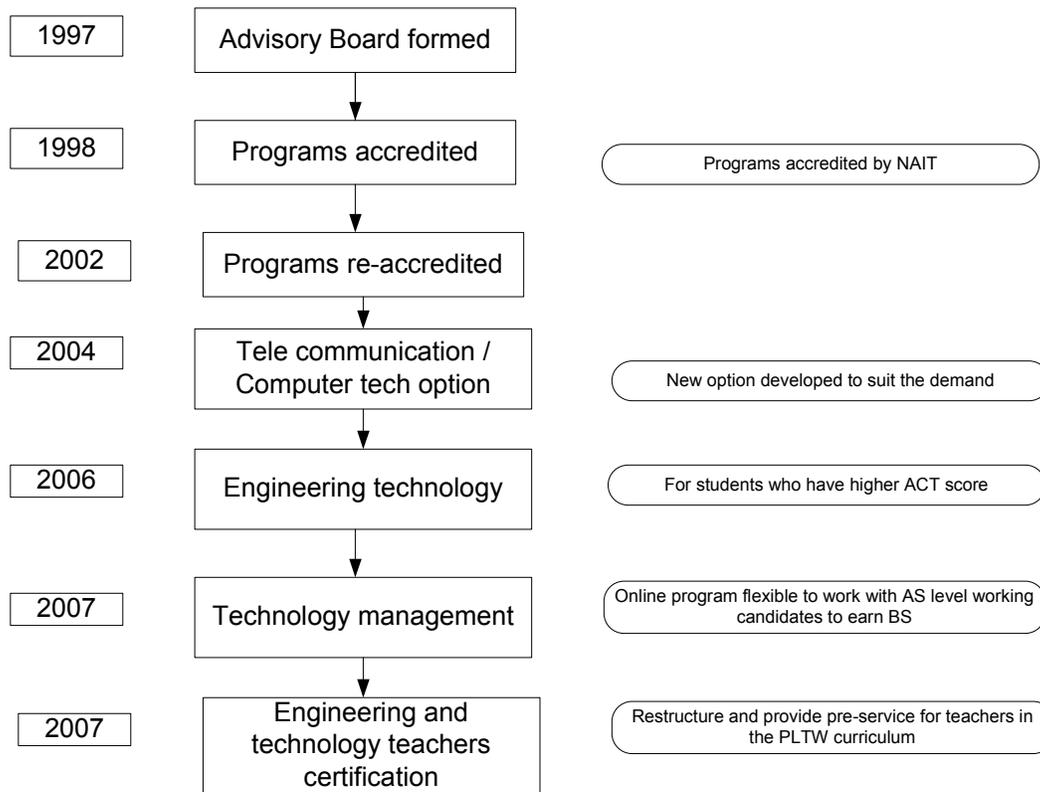| Year	Program	Note
1997	Advisory Board formed	
1998	Programs accredited	Programs accredited by NAIT
2002	Programs re-accredited	
2004	Tele communication / Computer tech option	New option developed to suit the demand
2006	Engineering technology	For students who have higher ACT score
2007	Technology management	Online program flexible to work with AS level working candidates to earn BS
2007	Engineering and technology teachers certification	Restructure and provide pre-service for teachers in the PLTW curriculum

Figure 2: Growth chart of the department programs in the past 10 years

In 2007, the department is beginning to restructure the Industrial Education program that has almost faded to translucency. With the Commonwealth of Kentucky initiative for increasing pre-engineering curriculum in high schools, the department has undertaken efforts to restructure and provide pre-service teachers for this state effort. The program will be an Engineering and Technology teaching certification to support Project Lead the Way high school programs. The

department currently offers college credit for seniors of PLTW programs that enroll in the IET department for at least two years and have passed the mandated exit exams through PLTW.

Although many improvements have taken place throughout the history of the IET existence at Morehead State University, the most notable, influential development is the Industrial Advisory Board. With an assortment of representatives from every Industrial Technology option area (Manufacturing, Construction Management, Electrical/Electronics, Telecommunications and Graphics) majority of program/course modifications were influenced by them. They are part of our inner voice. The department holds an Advisory Board meeting twice a year, Fall and Spring, and includes university administration personnel such as the President, Provost, Dean, Associate Provost of Academic Outreach and Support and the Director of Career Services. The model in figure 3 shows the strength and commitment of the industrial partnership the IET department has with the Advisory Board.
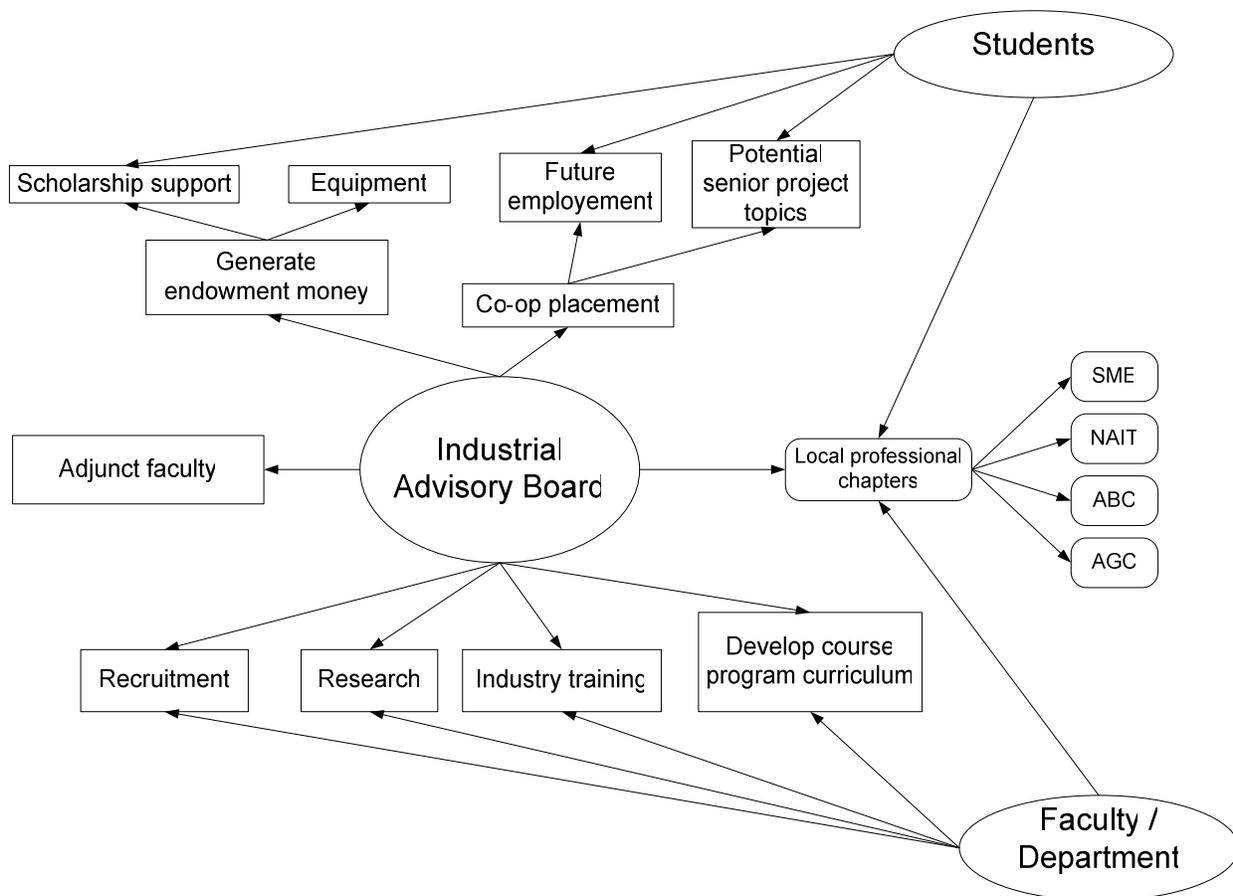

Figure 3: Relationship between the industrial advisory board, faculty/ department, and students

The figure 3 model also represents how the Industrial Advisory Board provides support for both the Faculty/Department and the Students. It allows a recruitment ground for industrial employees for new or continued education, research areas, industrial training opportunities and course/program curriculum development. Benefits for the student side are far greater in number

with opportunity to have industrial adjunct faculty to present real life scenarios in certain management based courses. The Advisory Board is generating endowment money to support scholarships to IET students and they support equipment donation in areas of need. The most important is cooperative education placement. This usually results in greater possibility of future full-time employment and helps develop topic areas for their Senior Project capstone course. The Advisory Board now supports the teaching, research, and service mission. They also advice the department chairs, faculty, and the administrative body of the university on strategies and means of developing resources for enhancing the goals and the objectives of the department and the service region. The advisory Board also helps in enhancing the visibility of the department presence in the commonwealth of Kentucky by supporting the faculty research and helping the students to secure employment. Many of the active alumni's are also the part of the Advisory Board there by helping the department to achieve department goals. Now the department has around forty advisory board members that have formed from the prominent industrial and corporate engineers, active alumni's from various sectors and localities.

There are various professional student bodies that are now active with in the department like the Society of Manufacturing engineers (SME), National Association of Industrial Technology (NAIT), American Building Contractors (ABC), and Associated General Contractors of America (AGC). The advisory board members, students, and the faculty also attend the various professional organization meeting of the parent chapter building a stronger relationship.

Conclusion

Without the strong influence of the Industrial Advisory Board partnership within the department, the program would have been disassembled years ago. Their influence, support, leadership and direction have given new light and hope. It has allowed the IET department to become creative, innovative and efficient in operations of surviving to a new day. For the new faculty a well crafted promotion and tenure policies have made them communicate well with there industrial partners and professional bodies which would help the department to communicate there priorities to them and also to promote a conduct that will contribute to long term growth and productivity. The faculty involvement and closeness with industry also has opened doors to new possibilities for students and departmental success by forcing persistence, flexibility and agility into departmental decision making. The Industrial advisory board has now become an external counsel to the department of Industrial and engineering technology in support of its teaching, research, and service missions. The collaboration with the industrial partners and advisory board members has now led the department to one of the most successful department at Morehead State University.

Franklin Bobbit wrote in 1918, "As the world presses eagerly forward toward the accomplishment of new things, education also must advance no less swiftly. To know what to do is as important to know how to do it" [5]

References

1. Bureau of Labor Statistics. (2007). *Local Area Unemployment Statistics* [Data file]. U.S. Department of Labor.

2. Dortch, S. (1997, October). A new generation at college - projections of college enrollment in the future. *American Demographics.* Retrieved September 17, 2007, from http://findarticles.com/p/articles/mi_m4021/is_n10_v19/ai_19827501

3. Ellis, D. (2007, September 21). The Navy Comes to Morehead in WWII. *The Morehead News, 124*(76), pp. a-9.

4. Flatt, Donald (Nov 1997). A Light to the Mountains: Morehead State University 1887 – 1997, ISBN: 0945084609, The Jesse Stuart Foundation publication

5. Flinders, D. J., & Thornton, S. J. (2004). *The Curriculum Studies Reader* (2nd ed.) New York: RoutledgeFalmer.

6. Marsh, C. J., & Willis, G. (2007). *Curriculum: Alternative Approaches, Ongoing Issues* (4th ed.) Upper Saddle River, NJ: Pearson.

7. National Center for Education Statistics. (2006, September). *Projections of Education Statistics to 2015.* Retrieved September 18, 2007, from http://nces.ed.gov/programs/projections/

8. Office of Institutional Research and Assessment. (2007). *Ten Year Headcount Data* [Data file]. Morehead, KY: Morehead State University. Available from http://www.moreheadstate.edu/ira/

9. Scott, J. L., & Sarkees-Wircenski, M. (1996). *Overview of Vocational and Applied Technology Education.* Homewood, ILL: American Technical Publishers.

10. Tanner, D., & Tanner, L. (1980). *Curriculum development: Theory into practice*. New York: Macmillan.

11. Smith-Mello, M., & Schirmer, P. (1994). Coal's Uncertain Future. *The Context of Change,* 42-45.

12. U.S. Census Bureau. (2007). *Historical Poverty Tables-Periods of Recession* [Data file]. Cambridge, MA: National Bureau of Economic Research. Available from http://www.census.gov/hhes/www/poverty/histpov/recessn.html

13. Yang, Y. (1998, August 11). *Estimating the Demand for Higher Education in the United States, 1965-1995.*

Bibliography

Jaby Mohammed received his B.S. in Mechanical Engineering from University of Kerala, India in 1997; he received his MBA with specialization in Operations Management in 2001, his M.S. with a concentration in Industrial Engineering from University of Louisville in 2002, and has a PhD in Industrial engineering from University of Louisville in 2006. His research interest includes advanced manufacturing; computer aided design, six sigma, and enterprise resource planning. He is a member of IIE, ASQ, SME, POMS, ITEA, NAIT, KAS, and Informs.

Mr. Sam Mason, CMfgT, CSIT is an instructor of Industrial and Engineering Technology in the areas of Manufacturing/Robotics and Graphics Technology. He has a Master of Science in Industrial Technology and currently pursuing an Educational Doctoral degree in Instructional Systems Design for curriculum and instruction. His industrial work background ranges from supervision, quality, manufacturing and automation engineering and instructional training.   He is Chairman – Elect for the Lexington, KY Society of Manufacturing Engineers chapter and on the State Project Lead the Way Certification Team

Xiaolong Li joined Morehead State University in 2006, after graduation from The University of Cincinnati with a Ph.D. degree in Electrical and Computer Engineering. He earned his Bachelor of Engineering and Master of Engineering degrees in Electrical and Information Engineering from Huazhong University of Science and Technology, Wuhan, China, in 1999 and 2002, respectively. Dr. Li teaches Computer Networking, Microprocessor, Computer Electronics, and Wireless Communications. Dr. Li's current research interest is in the area of wireless and mobile networking, especially in wireless ad hoc and sensor networks.