Collaboration leads to benefits for tenure-track faculty

James A. Ochoa, Jay R. Porter, Rainer Fink
Texas A&M University

Abstract
In order to be successful, tenure-track faculty members strive to develop distinct research programs that lead to funded work and publications. To be sure, faculty must also be successful in other areas such as teaching effectiveness and service to their university and profession. It is in the pursuit of a distinct research area that tenure-track faculty often overlook, or even purposefully avoid, opportunities to collaborate with other faculty members in their department. Their appears to be a blind notion that such interactions can lead to a reduced level of recognition for one's unique contributions. In contrast, tenured faculty members are less aggressive in avoiding research interactions and, in many instances, often seek out such opportunities. This team-friendly environment allows synergistic activities to evolve and be capitalized on, leading to stronger research programs. From an external perspective, funding agencies are placing a growing emphasis on interdisciplinary research projects. This trend has led to increased pressure on faculty to collaborate. In the case of industry-funded research, where projects tend to follow a multidisciplinary model, it is almost always the case that multiple investigators are involved. This paper addresses the issue of collaboration among tenure-track faculty members and describes several benefits that have resulted from a collaborative atmosphere created by tenure-track faculty members within the Electronics Engineering Technology Program at Texas A&M University.

I. Introduction.

The tenure process at Texas A&M University is not unlike that at other major universities in the U.S. New faculty must achieve a level of excellence in teaching and research and contribute to the University and profession through service and outreach [1]. The quality, significance and impact of a faculty member's accomplishments are key to their success. Because Texas A&M University is a research-intensive institution, its faculty focuses a great deal of time and effort on developing and expanding funded research programs. While new faculty members are typically highly motivated and have many ideas to pursue, they often face significant challenges in meeting the tenure expectations related to research because of their inexperience in winning external financial support. Since all researchers, both established and new, compete for the same funding, new faculty often have trouble getting "in the door."

In this respect, collaborating with other researchers can be a source of great opportunities. By working together, doors can be opened to the new faculty member more quickly. In fact, many of today's funding opportunities, especially industry-sponsored projects, are interdisciplinary and require faculty collaboration. At the same time, there is a *perception* that the only path to tenure is to create a unique and individual program. A study of the nature and organization of university-based U.S. engineering research, conducted by the Center for Technology Assessment

and Policy at Washington University in St. Louis in 1993 [2], found that many of the faculty surveyed "report being involved in…collaborative research teams in addition to or instead of as principal investigators who head small research teams. However, when asked whether their research was team or individual, faculty tended toward the individual side." Although the team-orientation of U.S. engineering faculty research is growing, the individual principal investigator model is still viewed as very important. A factor influencing the level of collaborative activity is the research intensiveness of the institution. The study found a greater tendency by faculty at the more research-intensive institutions to have a widely adopted concept of working in teams as collaborating investigators. Hence, tenure-track faculty at research-intense universities may find a more supportive atmosphere for participating in collaborative research.

While tenure-track faculty members can find great success in collaborations, they must ensure that their contributions and leadership of research in collaborative efforts are clearly recognized. In his book "Tomorrow's Professor: Preparing for Academic Careers in Science and Engineering," [3] Reis echoes this view in the context of balancing the breadth and depth of the tenure-track faculty member's research strategy. "Developing depth…in research…is essential to academic success. You need to be known for something, and that something needs to be both important and unique." He states that one good reason for developing breadth of research in addition to depth is that "By knowing what's going on in related areas you increase the opportunities for collaboration in ways that can enhance your own scholarship."

Currently, the Electronics Engineering Technology Program at Texas A&M University has six permanent faculty with three of these being tenure-track members. Unlike with larger engineering faculties, the EET program hired these tenure-track members with an idea to diversify the existing set of research areas rather than necessarily expanding one specific area. As a result, the opportunities for incoming faculty to collaborate within the EET program were initially limited. As in any program, the EET tenure-track faculty members are working to establish distinct research programs. However, they have found great success in leveraging both joint collaborations as well as interdisciplinary projects in meeting their goals. This paper describes several examples of collaborative research efforts and their benefits.

II. Examples of collaborative efforts among EET faculty.

In 1998, the EET Program, through Dr. Fink, created a state-of-the-art mixed signal test research facility that is unique among universities. The laboratory, established through a significant financial donation by Texas Instruments and equipment donation by Teradyne, yields numerous benefits to the EET Program and semiconductor test engineering community. Texas Instruments has realized benefits through research results and greater access to engineers that are more prepared for semiconductor test positions. The nature of the partnership with TI (including its funding structure), the design of the lab facility, and the mixed-signal test curriculum represents a unique model within the Program.

To leverage these efforts, a joint collaboration was then formed between Drs. Porter and Fink. When Dr. Porter first joined the EET faculty in 1998, his focus was the development of measurement systems using virtual instrumentation. While looking for new applications, he worked closely with Dr. Fink to find potential areas of development in mixed-signal testing. Through contacts made previously by Dr. Fink, he was offered a summer fellowship at Texas

Instruments where he worked on the design of a virtual instrumentation characterization system for integrated circuits. It was through Dr. Fink's contacts and this work that Dr. Porter was awarded a major research project to pursue mixed-signal characterization research.

As a second example of this type of synergistic relationship, Dr. Ochoa collaborated with Dr. Fink to design a new initiative in digital test. Leveraging the model discussed above, Dr. Ochoa approached Motorola with the concept of duplicating the Mixed-Signal Lab with a digital test emphasis. Demonstrating a successful model led to the funding of a new laboratory and the possibility of new research opportunities.

Even more important than the benefits to the individual faculty members, when taken together these initiatives represent a broader opportunity to make an impact in semiconductor testing research. This impact will reach beyond Texas Instruments or Motorola alone by promoting the research results and curriculum to other universities. In addition, the combined initiatives represent an environment where broader research problems can be addressed that stretch across digital and mixed-signal testing. As the initiatives mature, attention will be placed on the creation of a research center of excellence aimed at developing collaborative research and academic interactions with other universities.

III. Examples of interdisciplinary collaborations.

Collaborations that are often even more beneficial are those that occur across departments. By teaming with faculty in different disciplines, one creates a breeding ground for new ideas. The results lead to new and distinct areas of research for those involved. Thus, it becomes easier to distinguish the contributions of the new faculty member. In addition, interdisciplinary activities are viewed as a positive for all faculty.

As an example, Dr. Porter has been collaborating with a faculty member in electrical engineering. By combining Dr. Wright's expertise in magnetic resonance imaging systems with Dr. Porter's knowledge of virtual instrumentation, they received funding to develop low-cost magnetic resonance imaging systems. In this case, Dr. Porter's involvement in this type of project hinged on being able to collaborate with a faculty member in another area. This particular project also helped establish Dr. Porter's credibility in the area of virtual instrumentation, an obvious requirement for finding new funding.

As a second example, Dr. Ochoa is collaborating with Dr. Langari from the Mechanical Engineering Department to develop an active rollover prevention system for heavy trucks. In this project, Dr. Ochoa is applying his experience with micro-controllers and digital electronics toward the development of an in-vehicle communication and control system. This coupled with Dr. Langari's expertise in the area of vehicle dynamics will lead to the implementation of an integrated system for rollover prevention. The ultimate goal of this project is to eventually develop a truck safety consortium.

IV. Conclusion

In this paper, several successful collaborations by tenure-track faculty were described. While each of the examples involved working with other faculty, the common thread was that the

efforts led to independent, recognizable accomplishments. More importantly, the opportunities described occurred specifically due to collaborative efforts.

Bibliography

1. Texas A&M University College of Engineering, July 1992, *Appointment, Promotion and Tenure Criteria for Faculty.*
2. Kannankutty, N, R.P. Morgan, and D.E. Strickland, "University-Based Engineering Research in the United States," Journal of Engineering Education, vol. 88, no. 2, April 1999, pp. 213-222.
3. Reise, R.M., *Tomorrow's Professor: Preparing for Academic Careers in Science and Engineering,* IEEE Press, 1997.

JAMES A. OCHOA

James Ochoa received a BS degree in electrical engineering at Texas A&M University – Kingsville in 1990 and a Ph.D. in electrical engineering at Texas A&M University in 1999. After completing his Ph.D., he joined the faculty in the Department of Engineering Technology at Texas A&M University. His research activities include digital electronics and circuit testing, system-on-a-programmable-chip, and micro-controller based control systems. Dr. Ochoa can be contacted via email at j-ochoa@tamu.edu

JAY PORTER

Jay Porter received the BS degree in electrical engineering (1987), the MS degree in physics (1989), and the Ph.D. in electrical engineering (1993) from Texas A&M University. After finishing his Ph.D., he was a postdoctoral research assistant in the Departments of Electrical Engineering and Chemistry at Texas A&M University. From 1995 to 1998, he was an Assistant Professor at Lamar University in Beaumont, TX. In August 1998, he joined the Electronics Engineering Technology faculty at Texas A&M University. His research activities include the design of medical imaging electronics and virtual instrumentation systems.

RAINER FINK

Rainer Fink received the BS degree in biomedical engineering (1988), the MS degree in biomedical engineering (1992), and the Ph.D. in biomedical engineering (1995) from Texas A&M University. After finishing his Ph.D., he was a lecturer in the Bioengineering Program and the Department of Engineering Technology at Texas A&M University. In August 1996, he joined the Electronics Engineering Technology faculty at Texas A&M University. His research activities include mixed-signal testing, analog circuit design and biomedical electronics.