

**Evaluation  
of the  
Technology Workforce Development  
Grants Program**

A Report to the  
Texas Higher Education Coordinating Board

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January 2005

## 2004 Technology Workforce Development Grants Program Evaluation Committee

**Dr. Cathy Fulton**, Co-Founder and Chief Technology Officer of NetQoS, Inc., a data network software company based in Austin, TX.

Dr. Fulton co-founded NetQoS in January 1999 and has grown it into a profitable company employing over 60 individuals. Prior to NetQoS, she was Vice President for Smaqcom, a network consulting partnership, and Research Scientist for Schlumberger, an oilfield services company. She also served as an officer in the United States Navy where she held the position of Division Director, Officer Physics, and instructor at the Naval Nuclear Power School.

Dr. Fulton received her Ph.D. in Electrical and Computer Engineering from the University of Texas, specializing in performance analysis of multimedia networks. She also holds a B.S. in Physics from Texas A&M University. Dr. Fulton is a National Science Foundation Fellow, received the Armed Forces Communications and Electronics Association (AFCEA) Educational Foundation Award, and was the 2001 Austin IT Technologist of the Year. She is the recipient of the Navy Achievement Medal as well as the National Defense Service Medal.

**Dr. Debra J. Richardson**, the Ted & Janice Smith Dean of the Donald Bren School of Information & Computer Sciences at the University of California, Irvine, and Professor of Informatics.

Dr. Richardson has been investigating software testing for over 25 years, having pioneered research in "specification-based testing." She is Director of the Ada Byron Research Center for Diversity in Computing and Information Technology (ABRC), whose mission is to study and promote diverse perspectives in computer science and engineering through research, mentoring, and outreach activities. ABRC is a hub of the National Center for Women and Information Technology (NCWIT), for which she serves on the Leadership Team. In addition to serving on numerous strategic advisory boards for other academic institutions, Richardson is director of MICRO (Microelectronics Innovation and Computer Research Opportunities), one of the University of California's Industry-University Cooperative Research Programs.

Dr. Richardson received her B.A. in Mathematics from UC San Diego, and her M.S. and PhD in Computer Science from the University of Massachusetts.

**Mr. Charles Roesslein**, Director of the publicly traded companies Atlantic Tele-Network, Inc., National Instruments, and Quovadx, Inc.

Mr. Roesslein is a retired officer of SBC Communications. He is currently the CEO of Austin Tele-Services. Previously he was President and Chairman of the Board of Directors of Prodigy Communications Corporation, an internet service provider. From 1999 until 2000, he was the President of SBC-CATV, a cable television service provider, and, from 1997 to 1999, the President of SBC Technology Resources, the applied research division of SBC Communications Inc.

Mr. Roesslein holds a M.B.A. in Finance from the University of Missouri-Kansas City, and a B.S. in Mechanical Engineering from the University of Missouri-Columbia.

# Evaluation of the Technology Workforce Development Grants Program

**Program Evaluation 2004**

Austin, Texas

January 11 and 12, 2005

**Cathy Fulton  
Debra J. Richardson  
Charles Roesslein**

## **Background/Introduction**

The 77th Texas Legislature passed the *Technology Workforce Development Act* (Senate Bill 353; Texas Education Code Chapter 51, Subchapter V, Technology Workforce Development, Sections 51.851-51.860) in 2001 and established the *Technology Workforce Development (TWD) Grants Program*. The two purposes of this act are to increase the number of engineering and computer science graduates in the state and to increase collaborations involving higher education institutions, engineering and computer science departments, and private companies in Texas.

The act also laid the foundation for the *Texas Engineering and Technical Consortium (TETC)*, a non-profit organization of private industry and academic engineering and computer science departments. Under the law, the state matches industry and federal contributions made for the purposes of the Technology Workforce Development Act. The private industry/state government partnership is a unique feature of this program.

The enabling legislation requires the review of this program by an external expert evaluation committee on a biennial basis, thereby prompting this second review. At the time of the review, the first two award cycles were active.

## **Evaluation Procedure**

The Texas Higher Education Coordinating Board staff provided the evaluation committee with an extensive package of background material prior to the site visit in Austin. During the visit, the committee met with groups of project leaders, program administrators, and industry and government representatives. The visit started with a briefing by Coordinating Board staff on the administration of the program. At this time, the committee also met with H. Thomas Dickey, the Chair of the *TWD Grant Program Advisory Committee*.

During the morning of the review, the committee met first with representatives of the Coordinating Board's TWD Grants Program Advisory Committee and with a group of TETC executives from industry and academia. Then it met with representatives from the Governor's Office, the Speaker's Office, and from Representative Brian McCall's office. The committee visited with project leaders from both electrical engineering and computer science departments in two separate meetings during late morning and early afternoon. The evaluation committee conferred with members of the 2003 proposal review panel via a telephone conference.

## General Comments

The Texas Technology Workforce Development Grants Program is clearly an outstanding concept. Moreover, the parties involved with the program, from program administrators to project leaders, are highly motivated and selflessly committed to accomplishing the program's goals. The program has experienced very challenging economic conditions; nonetheless, remarkable progress has been achieved due to the creativity and dedication of participants. In short, this is an excellent program. The State of Texas should be commended for the original creation and continued support of the Technology Workforce Development Grants Program.

## General Observations

There are two main thrusts for expanding the engineering and computer science workforce: increase the number of incoming college and university students that seek an engineering or computer science degree (recruitment), and increase the graduation rate of incoming students in the engineering and computer science departments of colleges and universities (retention). Recruitment efforts are focused on increasing the number of students considering an electrical engineering or computer science program, thereby increasing the size of the market, while retention efforts seek to improve the graduation success and thereby the supply to the existing market. It is difficult to measure the short-term impact of recruitment programs, and thus they can appear less cost-effective than retention projects. As a result a number of proposed projects dropped their recruitment initiatives when funding became difficult. This is unfortunate because recruitment efforts will have a more dramatic long-term impact on the workforce.

## Specific Recommendations

### A. Continuance

The Technology Workforce Development Grants Program will help ensure Texas' future as a technology leader. The program is not only well-conceived but also well-executed. It has demonstrated impressive creativity and remarkable success under particularly stressing economic conditions.

- *It is recommended that the program be continued at a funding level no less than that initially proposed, with a strong consideration for increased funding if budgetary constraints permit.*

### B. Operations

Below are 10 recommendations to further improve the effectiveness of the Technology Workforce Development Grants Program:

1. *Document effective best practices in a searchable knowledge base that can be accessed by all potential participants.* This will facilitate the widespread implementation and adoption of proven methods throughout the state. Note that some practices may be more (or less) effective in certain types of environments; this information should be captured in the knowledge base such that appropriate methods are selected.

2. *Support outreach projects directed at students in middle school.* By the time students enter high school, they are often already behind in the preparatory courses required for engineering degrees. For example, if a student does not take Algebra I in 8th grade, he or she will not have the background required for the necessary high school mathematics courses. This inadequate education can seem an insurmountable obstacle to the young high school student. Additionally, students' perceptions about engineering and computer science are frequently formed prior to high school; early intervention is the key to increased recruitment.
3. *Encourage projects that engage university Education Departments in cooperative initiatives with Engineering and Computer Science Departments.* This is a golden opportunity to influence and shape future teachers, who in turn will help recruit future engineers and scientists. Projects that involve active collaborative participation of both Engineering/Computer Science and Education Departments should be encouraged.
4. *Fund projects fully, at their outset.* The incremental funding model had an overall negative impact on the success of the program. Projects should not be supported unless they receive full funding, on schedule. If additional funding is to be provided based on a project achieving certain milestones, that additional funding should be held in reserve at the outset.
5. *Expand participation in the TETC intern (jobs) database (All Across Texas, AAT) to include any interested engineering and computer science student or graduate; open the database to all interested businesses willing to pay the required fee.* Currently there is an intern database (AAT) restricted to juniors and seniors who have achieved a specified grade-point average; the database can be accessed only by TETC member corporations. Currently there is no graduate database. Retention should be improved by allowing freshmen and sophomores to participate in the intern database, acquiring earlier exposure to the true nature of engineering/computer science careers. Opening the database to non-TETC member corporations has two effects: it increases the number of potential opportunities for the students, and it generates additional revenue for the program. The fee for non-TETC member corporations might be based on number of searches or other criteria. Further, expanding the database to include graduates of participant universities will encourage Texas graduating engineers and computer scientists to stay in Texas, as well as assist Texas corporations in hiring eligible graduates.
6. *Require meaningful measurements of progress throughout a project's lifecycle, and require progress reporting for previous projects in all requests for new funding.* Documentation of a project's progress throughout its lifecycle is beneficial on many levels: it provides some degree of return-on-investment visibility to shareholders, it sets expectations for future related projects, and it guides decisions on future proposals. Note that the current enrollment metrics may be misleading progress indicators for certain majors – particularly in the Computer Science discipline, where the “progressing” requirement of two semesters of science is inconsistent with the progress of Computer Science students, who often take these courses in their senior year because they are not prerequisites for major courses (as they are in engineering).
7. *Generally require that sustainability be addressed by all proposals. In particular, require that sustainability be addressed by proposals seeking to increase retention, and require that continuity be addressed by recruitment proposals that actively engage educators.*

Proposals directed at increasing retention should address how they will continue to operate following the termination of program funding. A viable sustainability program is not required for proposal acceptance, but at a minimum it must be addressed – the Project Leader should be required at least to put some thought into future, non-program funding. Projects that actively engage educators in an effort to recruit new students should not suddenly terminate when funding expires; some form of continuity following the cessation of program funding is required to ensure future participation and long-term impact. Proposals that actively engage educators should address a continuity program to ensure educators are not left “high and dry.”

8. *Encourage both experimentation with innovative ideas and the widespread adoption of proven best practices.* The 75/25 funding guideline, where approximately 75 percent of the funds is allocated to best practices and approximately 25 percent of the funds is allocated to new ideas, is a good approach. Grants for innovative, unproven ideas should normally be small compared to those for best practices. This will provide fertile ground for inquiry while limiting financial risk.
9. *Continue providing assistance for the writing of project proposals.* It is an unfortunate reality that poorly expressed brilliant ideas may be overlooked in favor of well-written lesser ideas. Of course, an idea without proper execution has limited value. Proposal writing workshops, early feedback prior to submission, and models of successful proposals are all useful techniques to improve proposal presentation. Workshops and feedback should be continued, but the addition of providing a few models of not only successful, but also clearly thought out and well-written proposals would benefit all potential proposal writers.
10. *Capture the recommendations from the Proposal Review Panels in a timely fashion.* The Proposal Review Panels provided useful insight into the program, but sufficient time had passed since they performed their review that memories had grown hazy. The Proposal Review Panels provided an exit interview immediately upon completion of their task; their recommendations from this exit interview should be documented.

# **Appendix A**

## **External Evaluation Materials**

*Material provided for review included:*

- Program Evaluation Schedule
- Background on Technology Workforce Development (TWD) Grants Program
  - Overview of Texas Engineering and Technical Consortium (TETC) organizations and committees
  - TETC industry member roster
  - Overview of TWD grants programs and TWD strategic principles
  - TWD Grants Program Advisory Committee roster
  - TETC and TWD organizational chart
  - TWD statute
  - Coordinating Board rules on TWD
  - TETC bylaws
- Information on Funding of Program
  - Fund raising summary, including TWD historic and FY 2005 planned budget pie diagrams and TWD fund distribution graph
  - External fund contributions table
  - State of Texas Interagency Cooperation Contract by and between the Texas Higher Education Coordinating Board and Office of the Governor
- Materials Regarding the TWD Grants Review
  - Selection criteria from the TWD 2003 competition
  - Instructions for Reviewers from the TWD 2003 competition
  - Proposal evaluation form from the TWD 2003 competition
  - Summary of TWD 2003 reviewer comments
  - All funded and not funded TWD 2003 proposals
  - All TWD 2003 review evaluations for funded and not funded proposals
- Competition Outcome
  - Grant statistics for TWD 2002 and 2003
  - Grants announcements for TWD 2002 and 2003
  - Funding distribution timetable for TWD 2002 and 2003
  - Funded projects strategy summaries and annual reports (HTML on CD media)
  - Print Screen: <http://www/thechb.state.tx.us/techworkforce/>
- Measuring Progress
  - TWD roster definitions
  - TWD roster summary table
  - Enrollment in TWD-funded degree programs (Figure from 2004 Annual Report)
  - Enrollment by success measures from TWD-funded computer science programs
  - Enrollment by race/ethnicity in TWD-funded programs
  - Enrollment by gender in TWD-funded programs

- All Across Texas Internship Program
  - All Across Texas website information (<http://ecac.engr.utexas.edu/aat/>)
  - Preliminary 2004 AAT internship tabulation
  
- Coordinating Board Publications
  - Evaluation of the TWD Grants Program, March 2003, including staff response on progress on recommendations from the first external review
  - Third Annual Report, October 2004
  - Second Annual Report, October 2003
  - Annual Report, October 2002
  - Program Announcement 2003 and revised Grant Conditions 2003
  - Program Announcement 2002 and revised Grant Conditions 2002

## Appendix B

### Schedule

## Technology Workforce Development Grants Program Evaluation

January 11 and 12, 2005

Evaluation Committee: *Dr. Cathy Fulton*, Co-Founder and Chief Technology Officer of NetQoS, Inc, Austin

*Dr. Debra J. Richardson*, The Ted and Janice Smith Dean of the Donald Bren School of Information and Computer Sciences at University of California, Irvine

*Mr. Charles Roesslein*, President and Chairman of the Board of Directors of Prodigy Communications Corporation, Austin

### Schedule:

January 11, 2005

8:00 p.m. Dinner. The Committee meets with Coordinating board staff (Linda Domelsmith, Director of Research and Reinold Cornelius, Program Director in Research) and the Chair of the Technology Workforce Advisory Committee (H. Thomas Dickey). Location: *an Austin restaurant.*

*At this opportunity staff will present an overview of how the State set up and operates the program and some outcomes of the program. The Advisory Committee Chair will relay his Committee's concerns.*

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January 12, 2005

7:30 a.m. The Committee meets for breakfast with members of the TWD Advisory Committee and with representatives of the Texas Engineering and Technical Consortium. Coordinating Board staff Marshall Hill, Linda Domelsmith, and Reinold Cornelius attend. Location: *Capitol Grill, within the Capitol Extension.*

*TETC representatives will explain industry needs and objectives. TWD Advisory Committee members will present an overview of the programs operation and direction.*

### TETC Representatives

Ms. Mary Beth Maddox, The University of Texas at Austin  
Ms. Janis Carter, Winstead Sechrest & Minick P.C.  
Mr. Steve Bonner, Texas Instruments

TWD Grant Program Advisory Committee Representatives

Mr. Ray Almgren, National Instruments  
Mr. H. Thomas Dickey, Intel, Advisory Committee Chair  
Dr. Ben G. Streetman, The University of Texas at Austin

8:30 a.m. Discussion with representatives of the Governor's Office, the Speaker's Office, and the office of Representative Brian McCall. Coordinating Board staff Marshall Hill, Linda Domelsmith, and Reinold Cornelius attend.  
Location: *Capitol Grill, within the Capitol Extension.*

*The purpose of this meeting is to give the Committee an overview of the objectives of the program from the perspective of state representatives.*

State Government Officials

Ms. Audrey Chang, Representative Brian McCall's Office  
Ms. Sarah Glover, Office of the Speaker  
Dr. MacGregor Stephenson, Office of the Governor

Visiting:

Mr. Steve Bonner, Texas Instruments; formerly (until summer 2004) at Representative Brian McCall's Office

9:30 a.m. Travel to Coordinating Board Headquarters.  
Location: Lone Star Room at 1200 E. Anderson Lane, Austin, Texas 78752

10:15 a.m. Meet with project leaders from computer science departments of small and large institutions.

*This group will give the Committee a perspective on the administration of the program and its general impact on computer science and higher education in Texas. Coordinating Board staff does not attend this session.*

Computer Science Project Leaders

Dr. Moonis Ali, Texas State University – San Marcus  
Dr. Calvin Lin, The University of Texas at Austin  
Dr. Arun D. Kulkarni, Texas A&M University – Corpus Christi  
Dr. Kay A. Robbins, The University of Texas at San Antonio

11:15 a.m. Phone conference with members of the proposal review panel from the 2003 competition.

*Members of the proposal review panel will give the Committee insight about selection criteria, proposal evaluation, and proposal quality. Coordinating Board staff does not attend this session.*

Proposal Review Panel Members

Dr. Christine M. Cunningham, Tufts University  
Dr. Ian Greenshields, University of Connecticut  
Ms. Marie Silverthorn, Texas Instruments  
Dr. Douglas B. Williams, Georgia Institute of Technology

11:45 a.m. Lunch. The Committee may wish to dine as a small group to discuss their observations. Coordinating Board staff does not attend.  
Location: an Austin restaurant.

1:15 p.m. Meet with project leaders from electrical engineering departments of small and large institutions.

*This group will give the Committee a perspective on the administration of the program and its general impact on electrical engineering and higher education in Texas. Coordinating Board staff does not attend this session.*

Electrical Engineering Project Leaders

Dr. Jonathan W. Bredow, The University of Texas at Arlington  
Dr. Fritz Claydon, University of Houston  
Dr. William Dillon, The University of Texas at Arlington  
Dr. Scott C. Douglas, Southern Methodist University  
Dr. Heinrich D. Foltz, The University of Texas - Pan American  
Dr. Archie Holmes, Jr., The University of Texas at Austin  
Dr. Raymond R. Shoults, The University of Texas at Arlington

2:15 p.m. Break

2:30 p.m. Committee meets in closed session to discuss conclusions and prepare first draft of final report.

*This time can also be used to follow up on any questions to Coordinating Board staff.*

3:45 p.m. Exit interview with Assistant Commissioner David Gardner, Assistant Commissioner Marshall Hill, Director of Research Linda Domelsmith, and Program Director Reinold Cornelius.

4:30 p.m. Depart