Date: Feb 21, 2011

From:  Gurdip Singh, Department Head and Professor,
Department of Computing and Information Sciences,
Kansas State University

To:   Clifford Fedler, Ph.D., P.E.,
Associate Dean of Graduate School,
Texas Tech University

Subject: External Review of the PhD Program of Department of Computer Science
at Texas Tech University

Preliminary Information

Sources of Information:
This report is based on the information provided in the self study documentation prepared by the Department of Computer Sciences at Texas Tech University, interviews with the Computer Science Department Chair, faculty and students, and reports from the previous self-study conducted in 2005. I also used the data from the Computing Research Association’s Taulbee survey of PhD granting Computer Science Department in USA as a reference.

Organization of the report:
As per the guidelines for the reviewers, I have organized the report into the following sections: (a) Program Overview and Vision, (b) Faculty Productivity, (c) Quality and quantity of graduate students, (d) Curriculum and Program of Study, and (e) Facilities and resources. At the end, I have provided some recommendations.

Report

Program Overview and Vision
The Department of Computer Science has a comprehensive mission in teaching, research and service, and has maintained a consistent level of performance over a number of years after its initial rapid growth in the number of faculty members. The department has developed strength in several areas in computer science with more emphasis on theory and scholarly publications. The department grew at a rapid face from 4 to 23 during its initial years, and currently has 20 faculty
members. Currently, there are 86 Masters and 35 PhD students, which is a reasonable number for the current faculty size. The vision and learning outcomes for the PhD program are comprehensive and align with the program of study offered to the PhD students. The students appear to be satisfied with the faculty interactions, choice of thesis advisors and their research productivity and publication record is good. As discussed in more details in the following sections of the report, the program could do better in a number of areas which include:

(a) Offering more financial support to PhD students,

(b) Promoting applied research, interactions with industry and collaborative research, and

(c) Increasing research expenditure with more faculty involvement in writing grant proposals.

Overall, the department has shown consistent level of good performance for a number of years, and with the improvements suggested above, they can reach their full potential. 

*Rating: Good*

**Faculty productivity**

As per the self study documentation, the Computer Science Department has 20 faculty members. The faculty is conducting research and teaching in a number of areas which include Logic Programming, Robotics, Artificial Intelligence, High Performance Computing and Software Engineering. There are some faculty members involved in interdisciplinary research in areas such as scientific computing and application of robotics to health care. The faculty appears to be more focused on theoretical issues in computer science. While foundational research is important and necessary, the department faculty can benefit by engaging in more collaborative and multidisciplinary research. Funding agencies look favorably at proposals which use computing to address problems in other disciplines, and the department faculty at Texas Tech is well positioned to engage in such research. Leadership and mentoring by senior faculty members in the department can help in this regard. With the recent departure of senior faculty members, I recommend hiring new faculty members at the Full Professor level. Another important trend for academia is collaboration with industrial partners. The faculty is encouraged to build upon existing industrial collaborations in the department and actively pursue new opportunities for industry involvement.

The average total faculty scholarly productivity, measured in terms of referred publications, is 40.7 per year for the period 2004-2009, and is 45 for 2009. While these numbers are good, they are lower than the average of 45 per year reported in the previous graduate program review conducted in 2005. The faculty participated in 121 professional committees in 2009 which is commendable. This shows high level of professional service contribution to the discipline. The number of books and book chapters published has remained consistent (3/year) over the past few years. The research expenditure reported is $1.266 million for 2009-10 (although it was not clear whether it was the award amount granted during that year or the actual expenditure). While this is higher than the previous two years, it is lower as compared to the national average. There needs to be more efforts in attracting research funding as this directly impacts the PhD program. A seminar series wherein department faculty is presenting research has been active during the past year, which will be helpful in establishing collaborations. A more active seminar series for external speakers is recommended to facilitate external collaborations.

In response to the last review in 2006, the teaching load for a faculty was reduced to 3 per year (2 and 1) and 1 and 1 in some cases. This course loading policy is reasonable and reduced teaching
load is important in order to increase faculty productivity. Similar course loading policies are present at other schools, but are typically tied to research productivity and course buyouts. Since the last review, there does not seem to be an increase in the overall faculty productivity as a result of this new course loading policy. The department should carefully evaluate this policy and be more selective in adjusting teaching load.

Rating: Good to Very Good

Quality and Quantity of Graduate Students and Graduates

The department currently has 35 PhD students enrolled. The enrollment has been in the range 31-47 in the past 5 years. The number of students is reasonable for the faculty size. The number of PhD students graduating has been 4-5 in the last four years. However, only 1 student graduated in 2008-2009. As compared to the national average, the graduation rate of 4-5 students per year is at average for a faculty size of 20. The low number last year can be attributed to lack of job opportunities which has also resulted in an increase in time-to-graduation.

The students appear to have a good experience in selecting advisors and interacting with them, and have an overall positive attitude. The students are required to write research papers as part of the PhD program requirements, and the data indicates that they are actively engaged in this process. There was a concern that students do not interact much outside of their research group. During the course of their studies, it is good to expose students to a broad range of areas so that they can recognize opportunities for collaborations, both as students and future researchers.

One of the concerns was the lack of funding for PhD students. About 40% of the graduate students are receiving some form of financial support. Ideally, PhD students must be funded to the maximum extent possible -- in particular, all PhD students should be admitted with a promise of 2-3 years of support. There was a concern that students are moving from the PhD program to the MS program after one year of study due to lack of financial support. The department should keep track of the number of PhD students at different stages in the program and identify what impact funding is have on retention. During the review process, it was mentioned that there is a proposal to increase the level of funding which is a step in the right direction. More fund raising for scholarship money, perhaps from industry, is needed. The department is able to attract a large applicant pool but it needs to be diversified to include more domestic students. The department should develop a strategic plan to recruit diverse and high-quality PhD students, which should include an attractive financial support package. There is some travel support for PhD students from Graduate School, but it is mostly supported by grants from faculty members.

Rating: Very good

Curriculum and Program of Study

The requirements for the PhD are comprehensive and address all aspects ranging for course work, requirement to publish and present research results, and presentations of research proposals to supervisory committee. There are several areas of specializations available for the students to pursue their research work. There was a concern that students do not have sufficient courses to choose from. There appear to be many courses at the graduate level in the catalog but they need to
be offered more regularly or the class sizes need to be increased. It appears that classes get filled up quickly and students are unable to enroll in desired classes.

A minor concern was that students are required to do more coursework in Computer Science as compared to students in doctoral programs in other Engineering departments at Texas Tech. In Computer Science, it can take up to three years for students to complete the coursework, which takes time away from research. It is fairly standard at other institutions to complete coursework requirements (organized courses) within a two-year time period.

From the discussions during the review process, it was found that the nature of the qualifying exam is decided by the supervisory committee, and they appear to have flexibility in deciding its format. Different institutions are following different formats ranging from uniform format to a flexible format. However, in most cases, the qualifying exam is an assessment mechanism, and hence a filter. In this regard, one concern was the timing of the qualifying exam – it appeared that it could be taken after the student has already been in the program for more than 2-3 years. Filtering students at this point, say after 3 years of PhD coursework, may not be fair to students. It is suggested that the department relook at this requirement and format.

*Rating: Good*

**Facilities and resources**

The facilities available in the department appear to be very good. The faculty and students have access to High Performance Computing infrastructure, which is maintained centrally. This is a good step (many institutions are still struggling with this) as it spreads the cost and eliminates the overhead on the Computer Science Department. The faculty members have adequate space for their labs and the students have offices within this lab. There was some concern that some of the Unix machines were old and need to be replaced.

The Engineering Job Fair does not seem to attract software companies. While this may not a major concern for the PhD students for final job placement, it can help them in getting internships during their program of study.

*Rating: Very good*

**Summary of Recommendations:**

The department has shown consistent level of performance over the years and the faculty is striving for excellence in scholarly work. The following is a list of recommendations based on the review (in the order of priority):

- Increase funding base for PhD graduate students so that more students can be supported over a longer period to time.
- Hire new faculty at the Full Professor level with the goal of establishing leadership and mentoring processes to increase collaboration and research expenditure.
• Promote faculty-faculty, student-student and faculty-industry interactions so that faculty can leverage existing strengths in a synergistic manner.

• Offer more choices of courses to students and review course-work requirements to allow more time for PhD students to focus research and research-focused courses.

• Review the timing and requirements for the PhD Qualifying exam.