

**Strategic Plan**

**Department of Computer and Information Science**

**The University of Mississippi**

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## **I. Introduction**

The faculty of the Department of Computer and Information Science completed this Strategic Plan in September 2005. The Plan details the faculty's current view of the Department's mission, its strengths and weaknesses, its opportunities for improvement, the threats to its continuing success, and its plans for the coming five years.

## II. Executive Summary

The Department identifies three primary mission areas: (1) undergraduate instruction, (2) research, scholarship, and graduate instruction, and (3) service to its constituencies. The following sections list the findings of the faculty's SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of each of these areas and the plans formed as a result of the analysis.

The principal strengths of the Department are:

- its people—bright students and a dedicated and skilled faculty and staff;
- a sufficient computing infrastructure for its current programs made possible, in part, by the \$1M Adler Endowment and other gifts;
- growing research and PhD programs.

The principal weaknesses of the Department are:

- insufficient funding of basic operating expenses;
- weak financial support for graduate student stipends and faculty/staff salaries;
- a faculty and staff too small to pursue more than a few of the opportunities and implement the ambitious plans;
- insufficient physical facilities to support innovation and growth;
- lack of both local and national recognition of its quality.

The principal opportunities of the Department are:

- better utilization of the talents of its people—faculty, staff, students, and alumni;
- recruitment of talented new faculty and PhD students;
- implementation of new instructional and research programs enabled by the expertise and outreach of its faculty.

The principal threats to the Department's continued success are:

- the national decline in enrollment of students in computer science programs;
- tight budgets that can lead to loss of funding for an instructor or faculty position;
- lagging faculty salaries that will make recruitment and retention challenging;
- uncertainty concerning the continued funding level of the Institute for Advanced Education in Geospatial Sciences (IAEGS).

### **III. Vision and Mission Statement**

The Department of Computer and Information Science at The University of Mississippi seeks to be among the best computing sciences departments in the nation.

The Department seeks to provide high-quality programs of instruction, research, and service and to refine them continuously to meet the evolving needs of its students and society. Toward this end, the Department shall:

- enable its undergraduate students to master the fundamental principles of computing and to develop the skills needed to solve practical problems using contemporary computer-based technologies and practices;
- empower its graduate students to understand advanced concepts, develop new technologies and methods, and expand the base of fundamental knowledge;
- cultivate a community of professionals that encourages scholarship and facilitates both applied and theoretical research;
- serve its constituents in government, industry, and the public as a resource on state-of-the-art computing science and information technology.

#### **IV. Mission Area 1—Teaching and Student Learning Outcomes**

##### ***Statement of General Goal***

As specified in the Mission Statement, the Department seeks to provide a high-quality program of undergraduate instruction and to refine the program continuously to meet the evolving needs of its students and society. In particular, the Department shall enable its undergraduate students to master the fundamental principles of computing and to develop the skills needed to solve practical problems using contemporary computer-based technologies and practices.

##### ***SWOT Analysis***

###### *Strengths:*

- The professional undergraduate program, the BSCS through the School of Engineering, has been accredited by the professional computer science accrediting agency since 1990 (first CSAC, now ABET/CAC). It was most recently reaccredited in 2003.
- The BA major in computer science through the College of Liberal Arts offers a flexible program for combining study of computing with other disciplines.
- The Department's curricula provide a good balance between the relevant theories and their practical applications.
- The Department has a long tradition of providing high-quality, student-focused instruction.
- The faculty is of high quality, with a wealth of experience. The faculty consists of five tenured faculty members with an average of over twenty years of college-level teaching experience each, three new tenure-track faculty members hired in the past two years, and two full-time instructors. Several of the faculty members have relevant work experience in business and industry contexts.
- There is a good student-to-faculty ratio allowing for close student-teacher interaction.
- During its history, the Department has attracted a sizable number of strong students, including several Taylor Medalists and Honors College graduates.
- The graduates of undergraduate programs are well perceived by employers in the region (such as Federal Express, International Paper, St. Jude's Children's Research Hospital, and Acxiom Corporation).
- The \$1M Adler Endowment enables the Department to maintain state-of-the-art instructional computer labs.

- There is sufficient staff to handle the needed system administration activities, with the addition of a Network Administrator staff position in 2003.
- The Department currently has adequate physical facilities in Weir Hall, which was renovated in 2002.

*Weaknesses:*

- Core undergraduate courses can only be offered once per year, and too few undergraduate elective courses are offered in most semesters. In 2002, the ABET evaluators were concerned about the impact of this situation on the students' abilities to finish their degrees in a timely manner without taking courses out of sequence.
- The operating budget is inadequate to handle the steadily increasing costs of the supplies and services needed to support the instructional program.
- The student recruitment activities and interaction with community colleges and high schools is insufficient.
- Faculty salaries are marginally adequate to attract competent new faculty members. Merit and cost-of-living increases for faculty often lag behind other institutions in the region, leading to salary compression and challenges in retention of faculty.
- Faculty and staff benefits (e.g., medical) in Mississippi are inferior to benefits in several states in the region. This can make recruitment and retention of faculty difficult.
- The University has no institutional policy or program for helping spouses of potential faculty find employment locally. This can make recruiting and retaining faculty difficult.
- Although the Department occupies a floor of a renovated building, the floor was not equipped with any new furniture as a result of the renovation and some areas such as the restrooms were not renovated at all. (The Office of Information Technology facilities downstairs were completely renovated and outfitted with new furnishings.)
- There are only a small number of companies interested in computing personnel that come to recruit on campus in the Career Center and at job fairs.

*Opportunities:*

- The newly approved laboratory support/maintenance fee for three courses should make the lab operation more self-sustaining without exhausting the commodities and contractual services lines on the operating budget.
- Given the diverse interests and experience of the faculty, there are many opportunities to develop new academic emphases and specialized courses that may help with recruitment and retention of students and the economic and technological advancement of the region.
- The Department has just begun to tap the talents and resources of its alumni. An example is the Woods Order “30 for 30” campaign initiated by Stephen Snead. This campaign has the goal of enrolling 30 computer science alumni and friends in the School of Engineering’s Woods Order in recognition of the program’s 30<sup>th</sup> anniversary.
- The pool of potential faculty is larger now than in more than a decade. If a faculty vacancy occurs before that situation changes, the Department can potentially attract very talented faculty into junior positions with less difficulty.

*Threats:*

- With the slowdown in the high-tech economy and weakening of the short-term demand for computing graduates, the number of newly declared computer science majors has fallen off nationally by about forty percent since Fall 2001. The local experience parallels the national trend.
- Some computing departments in the region have been able to start new programs in areas such as software engineering and bioinformatics. This seems to indicate that the computer science departments at those institutions enjoy a high level of institutional support for their efforts to grow. For the Department to continue to be able to compete, the University needs to consider a similar commitment to the Department.
- The State and University budgets remain tight, which makes a cut in funding possible and the allocation of needed new resources very difficult. This likely will continue to be a problem for some time because of the effects of Hurricane Katrina.
- One of the two full-time instructor positions is not on the regular budget.
- Faculty salary compression may increase because of tight budgets.
- Three of the five tenured faculty members are eligible to retire at their choosing. Replacement of these long-term faculty members with high-quality teachers will be

difficult and costly. A failure to replace these faculty members will endanger the ABET accreditation.

- Although increased faculty startup funds have improved the ability to hire new faculty members, the Department still cannot be competitive with some other universities in the region.
- Space, especially classroom, meeting space, and student workspace is quite limited. Without the allocation of new space, the Department will be restricted in its ability to undertake new educational initiatives and grow the size of its student body, faculty, and staff.
- The loss of the second Development staff position when Stephen Snead changed jobs will likely mean that some of the alumni development efforts initiated by Snead will proceed at a diminished level of attention.
- Because of a relatively open admissions policy, there tends to be a large number of students in the entry-level computer science classes who need remediation in basic skills such as English, reading, and mathematics. The extra work required for the instructor to assist these students tends to slow down the progress of the classes, causing the better prepared students to become bored and frustrated, possibly losing them to the field.

### ***Five Year Planning Goals***

1. Maintain ABET/CAC accreditation for the BSCS program.
2. Restore enrollment in the Department's programs to a level similar to levels in Fall 2000.
3. Update the course content and curriculum to meet the evolving needs of potential students and their employers.
4. Provide an alternative entry point into the BSCS and BA curricula that would assist students with weaker academic preparation or lack of confidence in their technical skills to enter the program in computing.
5. Add new program emphases in order to attract new students and better meet the future needs of society.
6. Obtain funding in the regular budget for the second instructor position.
7. Recruit high quality junior faculty to replace any faculty members who retire or leave for other reasons.

8. Continue to invest in new hardware and software for the laboratories and infrastructure in order to support the instruction, administration, and research.
9. Form an industrial advisory board consisting of business and industry representatives to advise the Department on all aspects of its programs.
10. Increase the full-time, summer, and co-op employment opportunities for computing science students.

### ***Implementation and Assessment Strategy***

1. Continue to operate the BSCS program according to ABET/CAC criteria. Assess this effort using the procedures for that accreditation effort. Conduct the needed self-study in 2007-8 and apply for renewal of accreditation. Organize for a successful accreditation team visit in 2008 with accreditation continued for the 2009-15 period.
2. Design and introduce new measures to increase recruiting and retention of undergraduate computer science majors. If there is no increase in the number of faculty (except funding for the second instructor position), then the target enrollment is 150 BSCS majors and 30 BA majors in Fall 2009. Assess these efforts by tracking enrollment annually.
3. Begin a comprehensive review of the course content from bottom to top. Seek to complete the review and have any changes in place by Fall 2007.
4. Add a “computer science 0” course as an alternative entry point for students who need to build their skills and confidence for computer science study. Seek to have such a course in place by Spring 2007.
5. Add new emphases on the BSCS program. The Spring 2005 changes to the mathematics and science requirements are a first step in the direction of adding the needed flexibility. Seek to have all needed changes in place by Fall 2007.
6. Continue to encourage the administration to fund the second instructor slot, which is very important to maintaining the ABET/CAC accreditation of the BSCS and the ABET/EAC accreditation of the other Engineering programs. The Department plans to request this funding each year until the request is granted.
7. Begin a faculty search immediately upon the retirement or departure of a faculty member. The goal will be to fill any vacant position with a highly qualified faculty member in the next appropriate recruitment cycle following declaration of the vacancy.
8. Seek to replace the computers in one of the Adler labs every two years and regularly upgrade or replace the servers as needed and financially feasible.

9. Begin work on forming an Industrial Advisory Board during the 2005-6 academic year, with a goal of having a board in place in 2006.
10. Continue to cooperate with the School of Engineering staff (e.g., Marni Kendrick, Mike Nash) and the Career Center in their efforts to expand co-op and internship opportunities and Career Fair participation, and continue to work with our contacts in business, industry, and academia to find opportunities for our students. The goal is to help place every qualified CS major and graduate in an appropriate position.

## V. Mission Area 2 –Research/Scholarship and Graduate Education

### *Statement of General Goal*

As specified in its Mission Statement, the Department seeks to provide high-quality programs of graduate instruction and research and to refine them continuously to meet the evolving needs of its students and society. In particular, the Department seeks to empower its graduate students to understand advanced concepts, develop new technologies and methods, and expand the base of fundamental knowledge. The Department also seeks to cultivate a community of professionals that encourages scholarship and facilitates both applied and theoretical research.

### *SWOT Analysis*

#### *Strengths:*

- The Department has an appropriate number of graduate students for the size of graduate faculty. Since the mid-1990's, the number of graduate students has doubled in size to a typical level of sixty students.
- The MS emphasis in computer science has long been an effective transitional program, which allows students with previous study in related fields to move into the discipline of computer science.
- Graduates of the MS emphasis in computer science are well-perceived by employers in the region (such as Federal Express, International Paper, St. Jude's Children's Research Hospital, and Acxiom Corporation).
- The interest in the PhD emphasis in computer science is increasing. In the past four years, the number of PhD students has doubled to approximately fifteen students. In that period, the emphasis area has graduated approximately one student each year.
- The success of the faculty and graduate students in scholarly publication is increasing. In the past four years, the number of scholarly publications by Department faculty, staff, students, and collaborators has approximately tripled.
- The Department is adding new equipment to support research and graduate instruction. Recent additions include an Orion, twelve-processor computer cluster, wireless network access in Weir Hall, a new database server, and several pieces of equipment to support individual faculty members' research.
- The level of funded research has increased dramatically in the past four years. This is due partly to an increased attention to research among the faculty. The dramatic increase is due largely to the NASA funding of the Institute for Advanced Education in Geospatial Sciences (IAEGS).

- The Adler Endowment funds provide laboratory facilities that are important for the graduate, as well as undergraduate, instructional program.

*Weaknesses:*

- The Department has limited space available for research and graduate students to work. Most research-oriented computer science departments against which we compete can provide dedicated workspace for each graduate assistant (regardless of whether a teaching assistant, graduate instructor, or research assistant). That is not possible with the current space allocation.
- The level of funding for graduate instructors and teaching assistants in the regular budget is inadequate to support a sufficient number of students at a sufficient level. The lack of adequate support hinders the ability to attract top graduate students and provides inadequate support for the undergraduate teaching mission.
- Support of graduate students is too dependent upon assistantships controlled by non-academic offices or other academic departments. Although beneficial to support of graduate students already here, they tend not to be useful at attracting good students initially. They also tend to be focused on the needs of the other department rather than of the computer science graduate and research programs.
- External research funding for graduate students is limited and unevenly distributed among the faculty research areas.
- Faculty members have diverse research interests. This is probably beneficial for the instructional programs, but it tends to hamper the development of a strong funded research program because it makes intra-departmental collaborations difficult.
- The amount of travel money in the operating budget is very small. A vigorous computing research program requires faculty members and graduate students to attend professional conferences.

*Opportunities:*

- The increased interest and enrollment in the computer science PhD emphasis is a significant boost to the research program. For example, the number of publications tripled in the same period that the number of PhD students doubled.
- There is considerable interest in new research areas including interdisciplinary research and educational initiatives involving other departments and research centers locally.

- There are many potential external collaborators, e.g., Oak Ridge National Lab, ERDC, USDA, high-tech corporations in the region, and researchers at other universities.
- The hiring of new assistant professors has added new research directions and contacts.
- There is potential interest in the region and across the nation in new “applied computing” MS emphases. For example, the technology and courseware developed by IAEGS provide a delivery vehicle and a base of course material for a possible new program in remote sensing (as well as a source of funding for that institute).

*Threats:*

- The funding from NASA for IAEGS is winding down. The loss of this funding will significantly reduce the support available for graduate students, travel, and other needs of the graduate and research programs.
- Although the number of students enrolling in the PhD program has increased, the attrition level is also quite high.
- The computer science discipline has a culture of scholarship that differs from the culture of other Engineering disciplines. For example, CS tends to emphasize publication in strongly refereed, highly competitive conference proceedings. The other engineering disciplines emphasize journal publication to a greater extent. This makes it difficult for computer science faculty to get appropriate recognition (e.g., promotions and research awards) within the School.
- Maintaining a good diversity among the graduate students may become more difficult. In good economic times, the Department has had difficulty in attracting good American students. Because of difficulty in obtaining student visas, the number of applications from some parts of the world (e.g., China) has decreased considerably in the past few years. This has resulted in an applicant pool without the international diversity that it had in the late 1990s.
- So far, the Department’s PhD graduates who wish to become faculty members are not having as many quality opportunities as they should.

***Five Year Planning Goals***

1. Develop a high-quality research programs in accordance with the national standards of the computing discipline by increasing the quality and number of scholarly publications.
2. Increase the level and distribution of external research funding.

3. Seek to have a graduate student body with an appropriate number of students for the number of graduate faculty.
4. Establish partnerships with industry, government, alumni and professional societies.
5. Increase the visibility of the Department's research and graduate education capabilities, both regionally and nationally.
6. Recruit students and faculty members to maintain a healthy, diverse graduate program.
7. Make PhD graduates competitive for both faculty and research positions.
8. Explore the possibility of implementing new graduate emphases and programs that appeal to students not currently being attracted to the traditional programs.

### ***Implementation and Assessment Strategy***

1. Set an annual target of 3 high-quality publications for each full-time faculty member. For a faculty of 8 tenured/tenure-track faculty and 2 instructors, this would be an average of 30 publications annually. Encourage submission to journals and competitive conferences.
2. Encourage every tenured and tenure-track faculty member to submit at least one research proposal every year. Set a target for 2009-10 to average at least \$100K of research expenditures for each tenured/tenure-track faculty member.
3. Seek to have approximately 5 MS students and 2.5 PhD students per graduate faculty member. For the current graduate faculty size of 8, this would be 20 PhD students and 40 MS students for a total of 60 graduate students. (To accomplish this, the department needs to maintain the same number of graduate students as currently, but continue the shift toward PhD students.) Target an average of 20 MS and 3 PhD graduates per year by 2009-10.
4. Pursue the contacts the faculty currently has in order to increase the number of collaborations with business and industry and seek new contacts.
5. Encourage faculty members to participate in regional, national, and international research conference organizing or program committees and as journal and proposal reviewers. The goal is for every tenured/tenure-track faculty member to be involved in the discipline regionally, nationally, or internationally.
6. Be proactive in pursuing American graduate students and international students from diverse areas. Seek to attract faculty with appropriate characteristics to attract and retain the diverse student body.

7. Review the PhD program requirements and practices to see what changes are needed to make the Department's graduates more competitive for desirable faculty and research positions.
8. Collaborate with the School of Engineering, the Institute for Advanced Education in Geospatial Sciences (IAEGS), Outreach, and other UM entities to make new graduate program options available when opportunities arise—on the branch campuses, via distance learning, etc.

## **VI. Mission Area 3—Service to the Public, Constituents, and the Profession**

### ***Statement of General Goal***

As specified in the Mission Statement, the Department seeks to provide a high-quality program of service and to refine the program continuously to meet the evolving needs of its students and society. In particular, the Department seeks to serve its constituents in government, industry, and the public as a resource on state-of-the-art computing science and information technology.

### ***SWOT Analysis***

#### *Strengths:*

- The Department has demonstrated its ability to organize regional computing conferences successfully such as the 2005 CCSC Mid-South Conference, which was hosted in Weir Hall on 1-2 April 2005.
- Various faculty members are involved with the organization of national (e.g., SIGCSE) and regional (e.g., McBIOS and CCSC:MS) computing conferences.
- Most faculty members serve as reviewers for national and international computing conferences, journals, or funding agencies.
- Department faculty members have historically been heavily involved with on-campus and local service activities such as the Faculty Senate, University standing committees, search committees, doctoral committees in other departments, various ad hoc committees and task forces, science fair judging, and recruiting activities.
- The Department supports a student chapter of the computing professional society ACM and of the honor society Upsilon Pi Epsilon. Faculty members serve as advisors for these organizations.
- The Department regularly sponsors one or more student programming teams to compete in regional ACM and other contests. A faculty member serves as the coach for the team(s).

#### *Weaknesses:*

- The Department has received little recognition within the computing discipline at the national level.
- Only limited funding is available for faculty to travel to participate in meetings and conferences, especially when not presenting a paper.

- Not all faculty members are involved in the regional, national, and international activities of the discipline.
- The relatively small faculty size limits what the faculty can be involved in without hindering the Department's teaching and research programs.

*Opportunities:*

- There are potential opportunities to host in Oxford such regional or national conferences as McBIOS and ACM SouthEast.
- Senior projects are often service for campus organizations or local groups (e.g. United Way, Leap Frog, Living Blues).
- The Department has a talented and motivated undergraduate and graduate student body, which can be tapped for various kinds of service activities.
- There is an almost unlimited set of opportunities for personal service to the community and profession by faculty members and students.

*Threats:*

- Budget cuts and potential loss of indirect funding may severely restrict any service activities that take money (e.g., travel) to support.
- The lack of public transportation to Oxford (e.g., no local airport with commercial service or a frequent and reliable shuttle service) and sometimes competition for local hotel rooms and meeting spaces restrict the Department's ability to host national and international meetings.
- Service activities fall more heavily upon experienced tenured faculty members. Three of the ten faculty members are assistant professors who are concentrating on building their teaching and research programs, and two are instructors who, by job requirements, focus on teaching activities. If retirements occur before the assistant professors obtain tenure, then the ability of the Department to perform service will be severely constrained.
- It is easy is to let service activities overwhelm the ability of a faculty member to maintain high-quality teaching and vigorous research programs.

***Five Year Planning Goals***

1. Build stronger ties with Department alumni to learn of appropriate service opportunities and to better utilize the talents and interest of the alumni in its activities.

2. Seek to host a regional or national conference again in the next five years.
3. Have at least one faculty member serve on a national proposal review committee (e.g., NSF) every year.
4. Have at least one faculty member chair a national meeting session on average once per year.
5. Encourage faculty members to seek leadership positions in regional or national organizations.

***Implementation and Assessment Strategy***

1. Explore additional ways of connecting to and maintaining contact with Department alumni such as the “30 for 30” Campaign, a revived Department newsletter, an email listserv, alumni accounts on a Department server, etc.
2. Build relationships with various conferences and seek to host one that may enhance the capabilities and reputation of the Department and its faculty.
3. Request faculty members to report all service activities on their annual reports and evaluate whether the national participation goals are being met.

## **VII. Conclusion**

As noted in the Executive Summary, this Strategic Plan details the faculty's current view of the Department's mission, its strengths and weaknesses, its opportunities for improvement, the threats to its continuing success, and its plans for the coming five years.

In the guidelines for creation of the Plan, the faculty was to assume little new funding or space from the University. In this analysis, we assume no funding beyond the stabilization of the current faculty, staff, and programs and no space other than that currently allocated to the Department in Weir Hall and IAEGS in Kinard Hall. It is essential that some new funding be provided to maintain the current level of staffing (eight tenured/tenure-track, two instructors, one network administrator, and one secretary) and assure renewal of the accreditation for the 2009-15 period.

The conservative working assumptions do not allow us to respond to several of the opportunities that were identified. The possibility of significant new resource allocations would allow us to address more of the opportunities and express some of our more progressive ideas for Department growth.

The next five years will be a significant period for the Department. It will be a period when the Department remakes itself. It will recruit several new faculty members to replace long-term professors who choose to retire. In this effort, the Department will seek to preserve its long-term commitment to high-quality education while at the same time increasing its emphasis on scholarly activity and research. If the Department is to reach its potential, the faculty must proceed carefully, work diligently, and think creatively. It is also critical that the University recognize the importance of computing science and provide sufficient financial and space resources for the Department to reach its potential.