An Overview of Missouri University of Science and Technology
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ACKNOWLEDGEMENTS

> When done well, nothing of the scope of an accreditation self-study comes easily or quickly. Vice Provost Harvest L. Collier, who chaired the Missouri University of Science and Technology (Missouri S&T) Accreditation Self-study Steering Committee (Steering Committee), deserves and has the deepest gratitude of the institution and his colleagues for orchestrating an inclusive, thorough and candid evaluation of the institution. He championed the value of the self-study process beyond achieving re-accreditation.

The Steering Committee and its subcommittees worked for two years to identify potential data sources, to collect data and to evaluate them in light of the accreditation criteria. These faculty and staff members each made unique and valuable contributions. They were absolutely instrumental to the quality of the final product.

The contributions of many units were invaluable in engaging the campus in the self-study process and then producing the final report. A special thank you goes to Brooke Durbin of Information Technology for her many hours building the document repository and evidence collection templates. Special mention also goes to the Office of Institutional Research and Assessment, which provided timely responses to our requests for information.

The Missouri S&T Accreditation Self-study Steering Committee met early on with the Missouri State University (MSU) accreditation self study steering committee thanks to Dr. Bill Cheek, associate dean of the College of Natural and Applied Sciences. The MSU team and its self-study document served as a valuable resource for the Missouri S&T committee.

Mary Breslin of the Higher Learning Commission reviewed an earlier version of Missouri University of Science and Technology’s self-study. Her comments reassured us at a critical point in the process and helped us improve the document in important ways.

As we designed the appearance and functionality of our printed and electronic materials, we wish to acknowledge our use of the excellent Central Michigan University and Northern Arizona University self-studies as models. We also want to give credit to Michigan State University for their outstanding evidence-collection model. To complete the final stages of producing the report, Jesse Singleton and Colin Smith of the Missouri S&T printing and mail services office worked closely and patiently with us to develop a product with which we are very pleased. The photographs used within the self-study were provided by the Missouri S&T publications staff, whose talents and creativity capture and document the energy and traditions of Missouri S&T.
Finally, the work of many Missouri S&T staff members should be recognized, including Eddie Grover-Bisker, Amy Gillman and Summer Young, who coordinated the self-study project and communications surrounding accreditation and prepared the materials for the visit. They turned frequently to the reliable support of students Vamshi Kadiyala and Sasikiran Burugapalli.

COMMITTEE

The Missouri S&T re-accreditation review self-study steering committee members are:

- Jerry Bayless, associate professor, civil, architectural, and environmental engineering
- Harvest L. Collier, vice provost, office of undergraduate studies and professor of chemistry
- Caroline Fisher, chair, business and information technology
- Ralph E. Flori Jr., associate professor, interdisciplinary engineering
- Amy M. Gillman, assistant to the vice provost, office of undergraduate studies
- Jay W. Goff, dean, office of enrollment management
- Larry Dale Gragg, Distinguished Teaching Professor and chair, history and political science
- Edna Grover-Bisker, project specialist, office of undergraduate studies
- Thulasi Kumar, director, office of institutional research and assessment
- Wayne Huebner, chair, materials science and engineering
- Roberta Morgan, international student advisor, office of international affairs
- Jim Murphy, assistant vice chancellor, office of student affairs
- Jia Ren, institutional research associate for assessment, office of institutional research and assessment
- Laura Stoll, registrar
- Henry Allen Wiebe, dean, School of Extended Learning
- Summer Young, manager, student experience programs, office of undergraduate studies

Committee Members on Reserve:

- Jimmy Ryle, executive staff assistant II, office of the provost (retired)
- Lee Saperstein, professor, mining and nuclear engineering (retired)
- Robert W. Schwartz, vice-provost, office of academic affairs and professor, materials science and engineering
Subcommittees
The Missouri S&T re-accreditation review subcommittees are:

**Criterion One: Mission and Integrity:**
- Caroline Fisher, chair, business and information technology
- Laura Stoll, registrar

**Criterion Two: Preparing for the Future:**
- Ralph E. Flori Jr., associate professor, geological sciences and engineering
- Jay W. Goff, dean, office of enrollment management

**Criterion Three: Student Learning and Effective Teaching:**
- Amy M. Gillman, assistant to the vice provost, office of undergraduate studies
- Larry Dale Gragg, Distinguished Teaching Professor and chair, history and political science

**Criterion Four: Acquisition, Discovery, and Application of Knowledge:**
- Jerry Bayless, associate professor, civil, architectural, and environmental engineering
- Wayne Huebner, chair, materials science and engineering

**Criterion Five: Engagement and Service:**
- Roberta Morgan, international student advisor, office of international affairs
- Jim Murphy, assistant vice chancellor, office of student affairs
- Henry Allen Wiebe, dean, School of Extended Learning
PREFACE

> This document presents the results of a comprehensive self-study of Missouri University of Science and Technology (Missouri S&T), formerly known as University of Missouri–Rolla (UMR), that was carried out by the campus community between 2006 and 2008. Significant changes mark Missouri S&T’s recent progress. Completing this self-study, which was prepared for the university’s decadal review by the Higher Learning Commission (HLC) of the North Central Association (NCA) of Colleges and Schools, provided a golden opportunity for Missouri S&T to assess the effects of recent changes and to plan for the future.

The mission of Missouri S&T is to integrate education and research to create and convey knowledge to solve problems for our state and the technological world. The vision of Missouri S&T is to become a top-five technological research university by 2011. Both the new vision and mission are clearly stated in the 2007 Strategic Plan and its accompanying Tactical Plan.

The HLC last reviewed and accredited Missouri S&T in 1999. Since 1913, periodic institutional self-reviews have been an integral part of Missouri S&T’s accreditation renewal process. The present self-study differs significantly from previous self-reviews in both the content and the extent of campus involvement. In the past, fairly small representative groups worked to document the ways in which Missouri S&T met the criteria for accreditation. These groups focused on gathering institutional data descriptive of the state of the university at the time of review. Their reports were largely accounts of those characteristics and the changes that had occurred since the previous review, which was consistent with the process then expected by the North Central Association, Missouri S&T’s regional accrediting body.

In contrast, the present self-study effort set goals for universitywide involvement and a more evaluative than descriptive self-examination. This effort was driven by a combination of the new accreditation criteria adopted by the HLC, Missouri S&T’s own movement toward continual improvement, and the desire for a campus wide discussion of the mission, vision and strategic plan. The result provides a comprehensive set of information and analyses to benefit Missouri S&T beyond re-accreditation. In fact, some self-study findings have already had beneficial effects, including identifying assessment shortcomings and initiating the creation of a universitywide assessment committee.
OVERVIEW OF THE 2006–2009 SELF-STUDY PROCESS

Chancellor John F. Carney III appointed Vice Provost Harvest L. Collier to coordinate the university’s re-accreditation process, including the preparation of the self-study in 2006. In turn, Vice Provost Collier drew Steering Committee members from different sectors of the university to provide broad representation of campus perspectives. Collectively, the team consulted with students, faculty, staff and administrators in putting together this report.

The Steering Committee began meeting weekly in early 2006. During those early organizational meetings, the committee members established a Self-Study Plan and timeline and developed an evidence collection plan for gathering and evaluating evidence for the self-study. The Steering Committee created five subcommittees, each charged with responding to one of the five criteria for accreditation. The subcommittees assumed an institutional perspective while conducting committee work, contributing their perspectives as representatives of units but within an institutional context. The Higher Learning Commission’s expectation that accredited institutions critically evaluate alignment between institutional practices and self-identified mission, goals and vision statements was a guiding consideration.

The Steering Committee held numerous meetings across campus in fall 2006 (including an extensive email participation campaign) to prepare for the spring 2007 data collection period. An open forum launched the beginning of data collection. During the first half of 2007, the Steering Committee and subcommittees gathered, processed and summarized information relevant to the accreditation criteria and brought the self-study to the attention of the university community. The Steering Committee asked every academic and support unit on campus to contribute examples and data via a template for each criterion. The Steering Committee also provided a workbook with examples and instructions for submitting unit examples. The committee posted examples on the accreditation website, sent out monthly email reminders to each unit (see Evidence Collection Matrix), and convened a series of workshops. Missouri S&T’s Accreditation Self-Study Evidence Collection Workbook and Evidence Collection Matrix are available in the Resource Room.

In the second half of 2007, the subcommittees began evaluating the meaning of that information relative to the university goals and HLC criteria. Input obtained through the campus wide evidence collection process, workshops and meetings, focus groups, surveys, and interviews served as the basis for subcommittee evaluations. The final self-study report incorporates summaries of the subcommittees’ conclusions.

Mechanisms for keeping the university community informed of committee progress and for soliciting input and feedback were intentionally included in the self-study process. The Steering Committee made periodic updates to various audiences throughout the process and the Missouri S&T Accreditation website kept self-study activities within public view. The Steering Committee conducted an online survey of university constituents to measure perceptions of university progress towards HLC accreditation criteria via the website.
THE SELF-STUDY REPORT

Format
The self-study report is available in both electronic and print formats. Supporting documents that serve as evidence for or substantiation of claims made in the self-study not included directly in the report are available separately on the accreditation website or in electronic or print formats.

Organization
The report contains a preface, an introduction, a foreword, and seven chapters. The introduction provides an overview of Missouri S&T, including its history, organizational structure, an accreditation history, and its relationship with the Higher Learning Commission/North Central Association. The foreword summarizes significant institutional changes in the past decade and Missouri S&T’s responses to concerns expressed in its last review. Chapters one through five cover the five HLC criteria for accreditation. Each begins with a brief description of the criterion as it relates to Missouri S&T and its mission, then describes for each core component what Missouri S&T does well, what we have learned, opportunities for improvement, and the corroborating evidence used in the self-evaluation. Each of these chapters concludes with a summary of Missouri S&T’s strengths and challenges relative to the criterion topic. Chapter six contains information regarding federal compliance and the institutional snapshot. Chapter seven contains a summary and analysis of the major findings, which concludes with a look toward the institution’s future.

SELF-STUDY OUTCOMES
Overall, the process has satisfied the institution’s aspirations to engage the campus in a comprehensive self-study that would serve as the basis for considering the current state and future of the university. In responding to the HLC’s expectations for accreditation, Missouri S&T’s self-study has revealed key institutional strengths and challenges that create opportunities for improving the institution.
Endnotes

2  http://provost.mst.edu/documents/Tactical_Plan_Progress_Report.ppt
3  http://accreditation.mst.edu/developing/timelines.html
4  http://accreditation.mst.edu/developing/developing_index.html
5  http://accreditation.mst.edu/input/input.html
6  http://accreditation.mst.edu/input/input.html
7  http://accreditation.mst.edu/documents/Missouri_SandT_Self_Study_Evidence_Submitted_Matrix1New.xls
8  http://accreditation.mst.edu/index.html
9  http://accreditation.mst.edu/developing/compliance_requirements.html
An Overview of Missouri University of Science and Technology
INTRODUCTION

Campus History

> Founded in 1870 as the University of Missouri School of Mines and Metallurgy, commonly known as the Missouri School of Mines (MSM), the university was a product of the land-grant movement of the late nineteenth century. In the initial years, MSM primarily educated mining engineers and surveyors. The university expanded slowly in the first 50 years. As the need for engineering and scientific education grew at the close of World War II, so did enrollment on the Rolla campus. Advanced graduate education and research began to assume greater emphasis during the 1950s as the Missouri School of Mines evolved into a world-class technological research university whose impact reached well beyond the state of Missouri and the nation.

In 1964, the institution changed its name to the University of Missouri at Rolla, later University of Missouri–Rolla (UMR) to recognize its expanding nature. UMR, as it quickly came to be called, was the science and engineering flagship of a reorganized four-campus University of Missouri System. The institution has continued to evolve and grow while maintaining a science and technology based mission. On January 1, 2008, its name was changed to Missouri University of Science and Technology (Missouri S&T). The new name better defines the university as a leading technological research institution and better defines its identity in the University of Missouri System. For over a century, Missouri S&T has been a national leader in equipping students to lead a global transition from an industrial to an information technology driven economy. Drawing students from all 47 states and more than 50 countries, Missouri S&T continues to focus on preparing students to use their innovative skills and strong work ethics to improve the lives of people in the United States and around the globe.

A Technological Research University

As a technological research university, Missouri S&T is a member of a distinctive group of American institutions of higher education. Technological research universities distinguish themselves by having a mission-based commitment to improving the world through the study and application of advanced science and technology. Today’s prestigious technological research universities have a reputation for providing superior education and robust research programs in the sciences, technology, engineering and mathematics fields (STEM). Over 50 percent of students at these institutions complete degrees in the STEM fields.
By this definition, seventeen technological research universities exist in the United States, including:

- California Institute of Technology
- Clarkson University
- Colorado School of Mines
- Florida Institute of Technology
- Georgia Institute of Technology
- Illinois Institute of Technology
- Massachusetts Institute of Technology
- Michigan Technological University
- Missouri University of Science and Technology
- New Jersey Institute of Technology
- New Mexico Institute of Mining and Technology
- Polytechnic University
- Rensselaer Polytechnic Institute
- South Dakota School of Mines and Technology
- Stevens Institute of Technology
- University of Alabama-Huntsville
- Worcester Polytechnic

While they attract the country’s most talented students, most technological research universities are also renowned for strong offerings in the humanities, liberal arts and social sciences, which complement and provide context to the technological strengths of such institutions.

Research

As Missouri’s premier technological research university, Missouri S&T believes that undergraduate research is an essential opportunity that should be available to every student, not just graduate students or the undergraduate students that participate in special scholars programs. Research is more than gathering data, analyzing trends or formulating new ideas; it is an experience. Faculty members share their expertise in the classroom every day and invite students to join them in experiential learning. These campus wide research efforts have led to the generation of more than $37 million of annually sponsored research.

Each year, approximately 100 students participate in experiential learning through the Opportunities for Undergraduate Research Experience (OURE) program. Through OURE, the campus funds individual undergraduate research projects with a stipend of $1,000 for each participating student. Participants work with a faculty mentor on a project of their design.

Due to these significant research contributions, the names of Missouri S&T students appear on published papers or patents for their work. Each spring, the campus hosts the Undergraduate Research Conference where students showcase their research projects and compete for prizes in a variety of categories. It is impressive that 37 percent of S&T’s inventors are students.
Undergraduate and graduate research is not limited to individual projects. Some student organizations, such as Miners in Space® (MIS), work as research teams. Through MIS, students conduct research in tandem with NASA aboard the agency’s famous KC-135 “Weightless Wonder.” As one of only 20 projects selected annually by NASA, Missouri S&T students have recently been selected three times to conduct welding experiments in microgravity.

Missouri S&T’s excellent reputation for graduate research conducted within academic departments and its 21 listed research centers and institutes serves as the core generator of the campus’ annual research awards and grants. It is the home of internationally recognized centers of transportation infrastructure, materials, environmental, manufacturing, and energy research and maintains a research blog called Visions and an online digital research repository called The Scholar’s Mine.

Missouri S&T Centers and Institutes

- Career Opportunities Center
- Center for Educational Research and Teaching Innovation
- Center for Entrepreneurship and Outreach
- Center for Environmental Science and Technology (CEST)
- Center for Infrastructure Engineering Systems (CIES)
- Center for Pre-College Programs
- Center for Technology Enhanced Learning
- Cloud and Aerosol Sciences Laboratory (CASL)
- Energy Research and Development Center (ERDC)
- Engineering Education Center at St. Louis
- Environmental Research Center for Emerging Contaminants (ERCEC)
- Institute for Environmental Excellence
- Intelligent Systems Center (ISC)
Materials Research Center (MRC)
Missouri Transportation Institute (MTI)
Rock Mechanics Explosives Research Center (RMERC)
South Central Regional Professional Development Center (RPDC)
Speech Communication Center
Student Design and Experiential Learning Center
Women’s Leadership Institute
Writing Center

Recognitions and Awards
As a top public university, Missouri S&T has earned numerous honors:

- Top 100 best value in public higher education according to Kiplinger’s *Personal Finance* 2008 rankings (67th for in-state students and 70th for out-of-state students)
- Forbes and PayScale, Inc.’s “Top Public Schools That Make You Rich”, 2008
- Forbes.com’s “America’s Most Connected Campuses,” 2006
- Top 25 “Entrepreneurial Campuses” by *Forbes Magazine* 2004
- The first American university to attain ISO 14001 certification for environmental management in 2001
- A “Key School” for Fortune 500 Companies including Boeing, General Motors, Caterpillar, Anheuser-Busch, US Steel, Ford Motor Company, Sprint, and Exxon

Enrollment
Since adding the Enrollment Management division in 2001, Missouri S&T has experienced fast and significant growth, as noted in the following table and charts.

**Fall 2008**

- 6,371 total students (38 percent increase since 2000)
- 4,912 undergraduates (33 percent increase since 2000)
- 1,459 graduate students (57 percent increase since 2000)
- 74 percent from Missouri
- 1,056 new first-time freshmen (52 percent increase since 2000)
- 286 new transfer students (46 percent increase since 2000)
- 467 new graduate students (34 percent increase since 2000)
- 1,419 females (highest female enrollment in more than 20 years)
Figure 4: Total Enrollment 2000–2008

Figure 5: Underrepresented Students Enrolled Fall 2000–2008
Record Enrollment for:
  - Non-Caucasian Minority Students: 655 (74 percent increase since 2000)
  - Under-Represented Minority Students: 464 (86 percent increase since 2000)
  - American Indian/Alaskan Native Students (33)

African American (299) Freshman Class Profile
  - 34 states
  - Average ACT 27.3 (upper 10 percent in nation)
  - 86 percent interested in engineering and science fields

Undergraduate Population
  - 22 percent female (369 additional female students since 2000)
  - 10 percent minority (278 additional minority students since 2000)
  - 2 percent international

Graduate Population
  - 23 percent female
  - 11 percent minority
  - 49 percent international Masters level
  - 67 percent international PhD level

Small Class Sizes
  - Student-to-faculty ratio 15:1
  - Average class size 29 students
  - Average lab size 17 students

Financial Assistance
About 74 percent of admitted students receive merit-based scholarships and more than 85 percent of enrolled students receive financial assistance in the form of scholarships, grants, loans and work-study funds. The average financial assistance package offered for the 2006–2007 academic year was more than $11,000. The total financial assistance offered for the 2006–2007 academic year was $62,415,262. The university invests over $17,000,000 of institutional aid and merit based scholarships and fellowships each year. The average indebtedness of a Missouri S&T graduate in 2007 was estimated to be $21,000, while the average starting salary exceeded $55,000.

Technology
Since 2004, the university's implementation of the PeopleSoft student and administrative information systems has moved most student services and many academic resources to a twenty-four hour, seven day a week, on-line network of service programs and enterprises. The campus houses 38 Technology Learning Spaces, 645 computers and dozens of digital scanners and laser printers. Ethernet ports are

More than 85 percent of Missouri S&T students receive financial assistance.
available throughout the main campus and in all residential facilities. Wireless access is enabled throughout the campus. In addition, the Information Technology (IT) Help Desk is available for all campus constituents. The campus uses technology in classroom and online learning environments. Ninety-three percent of students bring their own laptop to campus and have 24-hour access to their personal academic information through the campus Joe Miner Self-Service (Joe’Ss) system.

**Faculty**

The university understands the importance of small classes, personal attention and approachable faculty. With more than 400 faculty members, our student-to-faculty ratio is 15-to-1. On the first day of class, professors outline their expectations in a course syllabus that lists regularly-scheduled office hours during which they will be available to discuss questions about class. A typical class size is 29 students. An average lab section includes 17 students. With 4,900 undergraduate students, Missouri S&T is a comfortable, personable campus. Ninety-nine percent of full-time tenured and tenure-track faculty have a PhD or the highest degree awarded in their field. Student advising is conducted by individual faculty members, many of whom have been involved in [faculty development programs](#).

**Career Success**

Since 2001, approximately 96 percent of all reporting graduates secure admission to a graduate or professional school or secure a position in the field of their choice within three months of graduation and earn starting salaries above national averages (more than $55,975 for 2008 graduates). In 2007–2008

- 4,392 on-campus interviews were conducted
- 673 employers recruited on campus to fill co-ops, internships and full-time jobs
- 161 employers in 36 states provided 463 cooperative education (co-op) job opportunities for students
- The average monthly co-op salary was more than $2,647
- Eight full-time staff career advisors were employed to address [needs of recruiters and students](#)

<table>
<thead>
<tr>
<th>Year</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
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<tbody>
<tr>
<td>2003</td>
<td>$47,305</td>
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<tr>
<td>2004</td>
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<td>2005</td>
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<td>2006</td>
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<td>$53,042</td>
<td>$58,120</td>
<td>$62,751</td>
<td>$63,640</td>
</tr>
</tbody>
</table>
Academic Programs (graduate and undergraduate)
Missouri S&T has more than 65 academic programs that grant degrees including PhD, DE, ME, MST, MBA, MS, MA, BS, BA and certificates in the following categories:

- 19 engineering fields
- 8 science, applied science and geology fields
- 6 mathematics, computer science, business and technology fields
- 6 social science and humanities fields
- 1 secondary teacher certification program

Complete Listing of Abbreviations and Academic Degree Program Majors and Minors

Abbreviations for Degree Programs
- CERT: Certificate Programs
- MI: Minor
- BS: Bachelor of Science
- BA: Bachelor of Arts
- MS: Master of Science
- ME: Master of Engineering
- MST: Master of Science for Teachers
- MBA: Master of Business Administration
- DE: Doctorate of Engineering
- PhD: Doctorate of Philosophy

Degree Programs (MI signifies that students may earn a minor in the discipline)
- Aerospace Engineering (BS, MS, PhD) MI
- Applied and Environmental Biology (MS)
- Applied Mathematics (BS, MS) MI
› Architectural Engineering (BS)
› Biological Sciences (BA, BS, MS) MI
› Biomaterials (MS)
› Business Administration (MBA)
› Business and Management Systems (BS)
› Ceramic Engineering (BS, MS, PhD)
› Chemical Engineering (BS, MS, PhD, DE)
› Chemistry (BA, BS, BS non-ACS Certified, MS, MST, PhD) MI
› Civil Engineering (BS, MS, PhD, DE)
› Computer Engineering (BS, MS, PhD)
› Computer Science (BS, MS, PhD) MI
› Earth Sciences (MST)
› Economics (BA, BS) MI
› Electrical Engineering (BS, MS, PhD, DE)
› Engineering Management (BS, MS, PhD) MI
› English (BA)
› Environmental Engineering (BS, MS)
› Geological Engineering (BS, MS, PhD, DE) MI
› Geology and Geophysics (BS, MS, PhD)
› Geotechnics (ME)
› History (BA) MI
› Information Science and Technology (BS, MS) MI
› Interdisciplinary Engineering (BS)
› Manufacturing Engineering (MS, ME)
› Materials, Science and Engineering (MS, PhD)
› Mathematics (MST, PhD) MI
› Mechanical Engineering (BS, MS, PhD, DE)
› Metallurgical Engineering (BS, MS, PhD)
› Mining Engineering (BS, MS, ME, PhD, DE) MI
› Nuclear Engineering (BS, MS, PhD, DE) MI
› Petroleum Engineering (BS, MS, PhD, DE) MI
› Philosophy (BA) MI
› Physics (BS, MS, MST, PhD) MI
› Psychology (BA, BS) MI
› Systems Engineering (MS, PhD)
› Teacher Education Program (Secondary Teacher Certification)
› Technical Communication (BS, MS) MI Approved by CBHE 06/14/06
Minors offered in addition to those designated MI above:
  › American Studies
  › Art
  › Bioinformatics
  › Business
  › Cognitive Neuroscience
  › Communication Studies
  › Energy Technology
  › Explosives Engineering
  › Film and Literature
  › Finance
  › French
  › Geology
  › German
  › Industrial/Organizational Psychology
  › International Economics
  › Leadership Communication
  › Literature
  › Literature and Film
  › Marketing
  › Materials
  › Military Science
  › Multiculturalism and Diversity
  › Music
  › Political Science
  › Pre-MBA
  › Pre-Law
  › Pre-Medicine
  › Psychology of Leadership
  › Russian
  › Science, Technology and Politics
  › Sociology
  › Spanish
  › Writing
Incoming Undergraduate Student Test Scores for 2007
For the Fall of 2007, new entering students achieved standard test scores in the mid-range represented by the middle 50 percent of new students. The mid-range ACT score was 25–30 while the mid-range SAT score was 1160–1350 for the 2007 academic year.

A Residential Campus
The university provides residential housing for more than 80 percent of its new students and serves to meet the campus-approved housing requirement for students who have not completed the equivalent of four semesters of college-level academic work. Campus-approved housing includes:

› 6 residence halls with over 1500 beds
› The Residential College, a suite-style living/learning community
› 1 apartment complex
› 20-plus fraternity and sorority chapter houses
› Academically-themed learning communities (see also Criterion 3)
  › First-Year Learning Communities
  › Music, Theatre and the Arts Learning Community
  › Introduction to Research Learning Community
  › Entrepreneurial Scholars Learning Community
  › Experiential Design Learning Community
  › Women as Global Leaders Learning Community
  › Honors Academy Learning Community

Athletics
As a member of the NCAA Division II in the Great Lakes Valley Conference12, Missouri S&T maintains varsity athletics programs that are represented by 13 varsity, scholarship-eligible sports and 19 intramural sports. Each year over 340 undergraduates participate in varsity athletics. These students have achieved success on the athletic fields and in the classroom. Missouri S&T’s NCAA academic retention is among the highest in the nation at 87% (the national average is 69%). Over half of the entire student body participates in intramural and recreational sports. In 2007–08 more than 250 intramural teams provided physical activities for well over 3,000 S&T students.

The Missouri S&T Athletic Program was ranked thirteenth nationally among the nearly 300 institutions in 2007. The ranking was based on athletic success, academic success rates of student-athletes, and U.S. News and World report ratings.

Library
Curtis Laws Wilson Library13 houses a well-rounded collection of nearly 600,000 journal volumes and 1,500 periodical subscriptions and has a comprehensive inter-library loan program. The library provides a wide array of state-of-the-art information technologies 24 hours a day through internet access. The library also houses the Western Historical Manuscript Collection,16 campus archives, the campus National Public Radio (NPR) station (KMST), and the Video Communications Center,17 which supports a multi-media area for developing video, computer and large-poster print presentations for coursework and research conferences. To further the library’s sense
of comfort and attractiveness to students and faculty, a coffee and snack bar was added in 2008.

Rolla Community

The 284-acre Missouri S&T campus is located in Rolla, Missouri, a community of approximately 20,000 in the heart of the Ozark Mountains. Rolla’s location, size, safety, affordability and amenities have brought it numerous recognitions as a high quality community to live and learn in. ePodunk.com’s 2002 evaluation cited Rolla as the 9th best “college town” with under 20,000 residents. The rankings evaluated college communities by their ability to provide “intellectual, cultural and economic hubs, balancing tradition with new business growth”. In 2007, Rolla was included in Sarah Tuff and Greg Mehlville’s book 101 Best Outdoor Towns — Unspoiled Places to Visit, Live & Play. Bizjournal.com selected Rolla as one of the top 15 “America Dream Towns” in 2006. In 1996’s The 100 Best Small Towns in America, Norm Crampton named Rolla one of the best small towns in America and the number one small town in Missouri. Further Rolla community information is available at www.rollacity.org.

Additional Information

Additional information about Missouri S&T may be obtained from the Office of Institutional Research and Assessment and the Office of University Communications, which are responsible for the consistent, accurate, and timely reporting of official institutional information.

ORGANIZATIONAL STRUCTURE, GOVERNANCE AND RESOURCES

Missouri University of Science and Technology is one of four campuses that make up the University of Missouri System. The other three campuses are located in Columbia, Kansas City and St. Louis. The University of Missouri is a constitutionally established unit of the state of Missouri. The Missouri Constitution also established a Board of Curators that is given a wide range of power by statute, as summarized in the Collected Rules and Regulations of the University of Missouri. The Board of Curators is made up of nine members who are appointed by the governor with the advice and consent of the state senate. The Board of Curators employs the UM System Administration, which consists of the President of the University of Missouri, five vice presidents, and various other staff members.

The State of Missouri also established a Coordinating Board for Higher Education (CBHE) in 1974 to serve as a clearing house for budget development and program coordination for all of Missouri’s public higher education institutions. The CBHE has statutory authority to approve degree programs at all public institutions within the state of Missouri.

The Board of Curators is not subordinate to the CBHE, but works with it to establish coordinated legislative requests for funding of higher education and to maintain a comprehensive program of higher education for the citizens of the state. The CBHE
works with the university president and the Board of Curators to coordinate budget requests for state colleges and universities.

The University of Missouri System Administration plays a dominant role in budget presentations to state government, which provides a major source of revenue (28 percent in FY07) for the campus. Budget proposals are prepared on the local campuses but are required to pass through two consolidation processes: one at the system level, where one budget for the four UM campuses and the UM System Administration is generated, and one at the state level, where one budget for all of public higher education is generated by the CBHE.

The governor submits a proposed state budget, including a higher education budget, to the legislature. Finally, the legislature passes a proposed budget and submits it to the governor, who has line-item veto authority.

Once financial resources are allocated to the campus by the UM System president, as approved by the Board of Curators, the UM System delegates significant administrative responsibility and authority to the local campus, which permits the campus to focus its total resource package on its own priorities for carrying out its mission and purposes.

The Board of Curators clearly understands Missouri S&T’s role within the University of Missouri System. In fact, the long-range planning process initiated by the board has served to focus and strengthen Missouri S&T’s mission and to make Missouri S&T unique among institutions in the state. The Missouri S&T Strategic Plan complements the Strategic Plan developed by the University of Missouri.

**Missouri University of Science and Technology Administrative and Academic Structure**

Each of the four University of Missouri campuses has a chancellor who serves as the chief executive of the campus. In fall 2006, Missouri S&T began planning a conversion to an academic organizational structure that contained no schools or colleges. The new organizational structure was implemented in August 2007. The term “restructuring” was adopted to define this major change. The provost led this organizational restructuring plan. The changes were designed to streamline the academic organizational structure and encourage greater interdisciplinary activities among departments and faculty.

The following charts, which illustrate Missouri S&T’s organizational structure in the years 2006 (Figures 1 and 2), 2007 (Figure 3) and 2008 (Figure 4), reflect the organizational changes that have taken place within the university.
University of Missouri-Rolla (UMR)
Organizational Chart
Effective Fall Semester 2006
September 1, 2006

Figure 7: Fall 2006 Organizational Chart

PROVOST & EXECUTIVE VICE CHANCELLOR-
ACADEMIC AFFAIRS
Warren K. Wray

CHANCELLOR
John F. Carney III

VICE CHANCELLOR-
ADMINISTRATIVE SERVICES
F. Stephen Malott

VICE CHANCELLOR-
STUDENT AFFAIRS
Debra Robinson

VICE CHANCELLOR-
UNIVERSITY ADVANCEMENT
Connie Eggert

Accounting [Fiscal] Services
Budget Office
Business Services
Printing & Mail Services
Environmental Health & Safety
Human Resource Services
Physical Facilities
University Police

Athletics & Recreation
Career Opportunities Center
Counseling & Academic Support Services
Residential Life & Student Support Services
Student Health Services
Student Life
Contracted Services
Chartwell’s Dining Service
University Bookstore

Alumni Affairs & Constituent Relations
Communications
Development Office
Public Radio KUMR

[ See next page for Academic organizational chart ]
The Board of Curators has provided for faculty participation in academic governance by approving the Bylaws of the Faculty of Missouri University of Science and Technology. According to the preamble, the bylaws are adopted “to facilitate communications and to provide for effective academic governance, for participation in decision-making, and for shared responsibility in academic affairs.” In accordance with the bylaws, the faculty is organized into departments, the graduate faculty council, Faculty Senate, General Faculty and standing committees. Provision for faculty governance and for input to the administration is made through the legislative and policy-making body of the faculty, the Faculty Senate. The Faculty Senate carries out the functions and responsibilities assigned to it by the General Faculty and considers matters referred to it by the Board of Curators, the university system president, the chancellor, and faculty members. Representatives to the Faculty Senate are elected by departments (one representative per 10 full-time faculty members). The chancellor and vice-chancellors are ex-officio voting members of the Faculty Senate and the chancellor may appoint ex-officio nonvoting members. Student representatives are selected by the Student Council and Council of Graduate Students. Student representatives have all privileges except voting. The Faculty Senate maintains standing committees in order to make decisions about academic matters and provide advice on budgetary affairs, student affairs, etc.

Student Council

Students participate in institutional governance in two primary ways. The purpose of the Missouri S&T Student Council is to represent the student body in its relations with the faculty and the administrative officers of the campus and to coordinate and regulate student activities. In addition, as previously noted, representative students participate in the Faculty Senate with all privileges except voting and students serve on appropriate standing committees.

The Student Council provides the mechanism for discussion and debate whereby all students may have a formal voice in campus affairs. Membership is composed of representatives from organizations approved by the Student Council for representation and by representatives for unaffiliated students. The council can petition the faculty on various matters and provides a forum for student opinion. The Student Council determines distribution of funds for selected programs with the funds coming from the student activity fee. Graduate students are represented by a Graduate Student Council which operates in a manner similar to the Student Council.
ACCREDITATION AT MISSOURI S&T

The University of Missouri (including Missouri School of Mines and Metallurgy) was first accredited by the North Central Association (NCA) in 1913. In 1964, the university system was reorganized into four separate campuses (Columbia, Kansas City, Rolla and St. Louis) and a number of state-wide extension offices. At that time, Missouri School of Mines and Metallurgy became the University of Missouri at Rolla (later University of Missouri–Rolla). In 1972, the University of Missouri–Rolla was granted NCA accreditation as an “operationally separate” campus offering coursework through the doctor's degree granting level. Each of the four campuses in the system is accredited separately by NCA. With many aspects of the four-campus system still in a state of flux at the inception of the new system, this accreditation was limited, calling for an evaluation in five years with particular attention to the doctoral programs. The comprehensive evaluation in 1978/79 resulted in “continued accreditation at the doctor's (research and professional curricula) degree-granting level” with the next evaluation scheduled for 1988/89. The 1989 visit continued the accreditation scheduling the next evaluation for 1998/99.

The comprehensive evaluation in 1998/99 required a report in 2002 to provide evidence of campus wide enrollment management (retention and recruitment) efforts. When the institution successfully provided that report along with evidences of enrollment improvements, the next evaluation was scheduled for 2008/09. Most of Missouri S&T's academic programs are accredited by one or more professional organizations. A complete list of programs that hold accreditation from accrediting bodies is available on the Institutional Research and Assessment website and is published annually in the Missouri S&T catalog.
ENDNOTES

1. http://chancellor.mst.edu/history/
2. http://chancellor.mst.edu/history/
3. http://www.umsystem.edu/
10. http://visions.mst.edu/
12. http://ems.mst.edu/
15. http://library.mst.edu/
17. http://vcc.mst.edu/
18. http://ira.mst.edu/
23. http://faculty.mst.edu/
24. http://stuco.mst.edu/
A Decade
of Growth
and Transition
FOREWORD

> Missouri S&T has continuously changed over the last decade. The campus community has made many efforts to better serve students, faculty and staff members and the community. This section focuses on changes during that decade that substantially impacted the entire university community. Missouri S&T’s student enrollments, academic program offerings and levels of research continue to grow significantly. Over the past ten years, the campus has built new facilities and revised organizational structures to better accommodate the growth and strategic plan priorities. These changes have significantly impacted the institution.

OVERVIEW OF THE MOST SIGNIFICANT CHANGES

The following is a brief overview of the major changes at Missouri S&T in the past 10 years. The changes listed provide a background for later sections of this report. Where appropriate, subsequent chapters discuss results and developments.

Organizational Developments

› Name change: In January 2008, the institution’s name was changed to Missouri University of Science and Technology.
› Academic reorganization: In 2007, the institution was reorganized from three schools and one college to a “no-schools or colleges” organizational structure. The new structure also included the creation of the vice provost for academic affairs, the vice provost of graduate studies’ offices, in addition to three new student support and retention focused offices under the vice provost of undergraduate studies: Centralized Advising Office, First-year Success Programs and Second-year Success Programs
› Strategic Planning: In 2003 and 2007, planning committees updated the university’s mission, vision and strategic plan and accompanying yearly tactical plans
› Office of Technology Transfer and Economic Development: Started in 2004, the office was created to spur additional entrepreneurship, regional economic opportunities, and resource development for the university and the faculty.
› PeopleSoft: From 2001 to 2005, the institution implemented the PeopleSoft enterprise resource planning system for most student information and administrative services. PeopleSoft is recognized for its ability to increase efficiency and provide tracking and reporting.
 › Homepages: Between 2002 and 2007, the university developed and launched three new university-wide homepages using different software platforms. The final platform employs the Documentum document management software.

 › Student Diversity Initiative: In 2003, Chancellor Gary Thomas expanded the enrollment management division to include support units for increasing the number of minority, female and pre-college students on campus. The new goals resulted in three new offices: Student Diversity Programs, the Women’s Leadership Institute and the Center for Pre-College Programs.

 › New School of Management and Information Sciences: By fall 2002, Missouri S&T had received Board of Curators approval to start a new school and degree programs focusing on the areas of business and information science technology. Based on student surveys, the new programs were in high demand from new and withdrawing students. In 2006, the school began offering a Masters of Business Administration and Masters of Information Science and Technology.

 › Center for Education Research and Teaching Innovation (CERTI): In 2002, the undergraduate and graduate studies office was charged with creating a new faculty development and training program to assist in creating a more effective learning environment for all disciplines.

 › Administrative Restructuring: In 2001, the Chancellor’s office re-organized into three new administrative divisions to address its strategic goals and performance shortcomings. The enrollment management, research and sponsored programs, and the office of undergraduate and graduate studies were created and division heads were hired and appointed. To provide greater focus within the academic division, the position of vice chancellor for academic affairs was re-titled as university provost and executive vice chancellor and made supervisor of all academic unit heads (deans, vice provosts, and directors).

New and Upgraded Facilities

New Academic Buildings:

 › Emerson Hall: In 1998, the university expanded and updated Emerson Hall to sustain the quality and technical depth of the electrical engineering program. The new facility provided additional faculty offices, administrative and clerical facilities, multi-disciplinary research laboratory facilities, and a modern lecture auditorium.

 › Butler-Carlton Civil Engineering Building: In 2003, the university expanded and renovated the Butler-Carlton Civil Engineering Building to allow for the consolidation and expansion of the civil engineering program. The project united the high bay structures lab and the environmental engineering section with expanded programs in hydrology/hydraulics; geotechnical engineering; transportation,
materials and surveying; administration and support for civil engineering; and a sizable classroom addition.

- Toomey Hall: In 2006, renovation and expansion of Toomey Hall was undertaken to provide a new world-class teaching and research facility that reflects the quality and caliber of Missouri S&T’s students and faculty.

- Havener Center: Opened in 2005, the Havener Center is used to fulfill Missouri S&T’s teaching, research and service mission. The Havener Center is the community center of the campus and provides students, faculty members, staff members and guests with programs, activities and facilities that complement the educational experience at Missouri University of Science and Technology.

**New and upgraded residence halls:**

- Residential College: In 2005, the Residential College opened, marking the first new residence hall at Missouri S&T in 25 years. The building has 82,000 square feet with 256 beds in a mix of four-person double semi-suites, four-person semi-private suites, four-person single suites, and single rooms for resident advisors. Student lounges, study rooms, laundry facilities, kitchens and a building lobby are also included.

- Residential Hall II/III: In 2007, Residence Hall II/III opened north of the Residential College. The building has 78,000 square feet with 276 beds in a mix of four-person double semi-suites and single rooms for resident advisors. Student lounges, study rooms, laundry facilities, kitchens and a building lobby are also included.

- Thomas Jefferson Hall: In 2007, Thomas Jefferson Residence Hall began a three-phase renovation process. Phase I provided extensive replacement of mechanical and electrical equipment and involved improving the student living environment while upgrading compliance with current safety standards.

**New Student And Campus Support Facilities:**

- Writing Center in Campus Support Building (2000)
- Student Health Center (relocated in 2003)
- Campus Police (relocated in 2003 and 2007)
- Expanded University Communications Suites (2006)
- University Center Redevelopment (2005–2007) to include the office of Research and Sponsored Programs, Human Resources, IT applications, New Student Programs, School of Extended Learning, Office of Technology Transfer and Economic Development, Center for Pre-College Programs, an art and design studio, computer learning center and five additional classrooms. The building will be renamed Centennial Hall in October 2008.
- Energy, Environment and Education Commons (2008)
# Academic Changes

Missouri S&T has added the following programs in the 10 years since the last accreditation:

## Bachelor of Science
- Architectural Engineering  FS2001
- Chemistry non-ACS Certified  FS2001
- Computer Engineering  FS1998
- Environmental Engineering  FS2002
- Information Science and Technology  FS2001
- Interdisciplinary Engineering  FS2005
- Technical Communication  SP2005

## Master of Engineering
- Geotechnics  SP2004
- Manufacturing Engineering  SS2002
- Mining Engineering  SP2002

## Master of Science
- Applied and Environmental Biology  FS2001
- Biomedical Materials  SP2004
- Computer Engineering  FS1998
- Environmental Engineering  FS2002
- Information Science and Technology  FS2001
- Manufacturing Engineering  SS2000
- Materials Science and Engineering  FS2005
- Systems Engineering  FS2000
- Technical Communication  SP2005

## Master of Business Administration
- Business Administration  FS2006

## Doctor of Philosophy
- Computer Engineering  FS1998
- Materials Science and Engineering  FS2005
- Systems Engineering  SP2007

## Undergraduate Certificate
- Design  SP2007
- Explosives Engineering  SS2008

## Graduate Certificate
- Business Essentials  FS2007
- Composite Materials and Structures  SP2007
- Contemporary Structural Engineering  FS2003
- Data Warehouses  SP2007
- Electrical Machine and Drives  SS2008
- Electrical Power Systems Engineering  SS2006
- Engineering Management  FS2006
- Engineering Mechanics  SS2006
- Enterprise Resource Planning  SP2006
- Explosives Engineering  SS2008
- Financial Engineering  FS2006
- Financial Mathematics  FS2008
- Geoenvironmental Engineering  FS2002
- Geotechnical Earthquake Engineering  FS2002
- Geotechnics  SP2007
- Human Computer Interaction  SP2004
- Infrastructure Renewal  FS2003
- Leadership in Engineering Organizations  FS2008
- Manufacturing Systems  SP2003
- Military Construction Management  SP2000
- Multimedia and Information Systems  FS2002
- Network Centric Systems  SS2005
- Project Eng. & Construction Mgmt  FS2004
- Project Management  FS2004
- Psychology of Leadership  SP2006
- Psychometrics  SP2007
- Software Design and Development  FS2002

## Undergraduate Minor
- American Studies  FS2003
- Business  SP2009
- Cognitive Neuroscience  FS2005
- Engineering Management  FS2005
- Explosives Engineering  FS2006
- Geological Engineering  SS2004
- Information Science and Technology  SP2003
- Marketing  SP2008
- Mining Engineering  FS2001
- Multiculturalism and Diversity  SP2008
- Pre-Law  SS2007
- Pre-MBA  SP2008
- Pre-Medicine  FS2002
- Psychology of Leadership  SP2004
- Psychometrics  SP2007
- Science, Technology and Politics  FS2003
- Technical Communication  SP2008

## Graduate Minor
- Explosives Engineering  FS2006
- Technical Communication  FS2006

## Secondary Education Certification Approval
- Applied Mathematics  FS2009
- Biological Sciences  FS2009
- Chemistry  FS2009
- Economics  FS2009
- English  FS2009
- History  FS2009
- Physics  FS2009
- Psychology  FS2009

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Table 2: PROGRAMS APPROVED OVER THE PAST 10 YEARS
**RESEARCH**

Missouri S&T has more than doubled externally sponsored research expenditures from $14,738,726 in Fiscal Year 1998 to $37,229,626 in Fiscal Year 2007, despite reduced campus support for research activities. This success can be attributed to faculty and campus leadership, a strong focus on science and engineering, commitment to promoting and facilitating interdisciplinary projects, retention of highly productive faculty, development of the research infrastructure, and support from Missouri’s U.S. congressional delegation.

Over the past 10 years, the university established three new research centers: the Center for Infrastructure Engineering Studies, the Energy Research and Development Center and the Missouri Transportation Institute. Unfortunately, funding for state-supported centers declined during this period. Funding for five state-supported research centers, the Center for Environmental Science and Technology, the Center for Infrastructure Engineering Systems, the Intelligent Systems Center, the Materials Research Center and the Rock Mechanics and Explosives Research Center, dropped by about 40 percent over the last five years as part of the budget shortfall. In 2004, the Environmental Research Center for Emerging Contaminants received about $200,000 annually from the UM System in response to the UM strategic initiatives program of that year.

The university established the Center for Educational Research and Teaching Innovation (CERTI) in 2004. CERTI is Missouri S&T’s faculty development center and has the primary charge of addressing issues in teacher development and student engagement to improve the campus learning environment and the learning outcomes of students.

**FINANCIAL DEVELOPMENTS**

While state appropriations as a source of revenue dropped from 42 percent in 2000 to 28 percent in 2007, the campus has enhanced its development efforts, including a capital campaign raising $33.7 million in gifts, pledges and grants during Fiscal Year 2006–07. This was the most successful year in the university’s fundraising history with $25.4 million directed to students, faculty, facilities and programs. Missouri S&T’s endowment has grown from $49 million in 1998 to $107 million in 2007.

**RESPONSE TO THE 1999 ACCREDITATION REVIEW**


The 1999 evaluation team identified seven “areas of concern.” The seven areas of concern from the 1999 study include

- Enrollment
- Decentralized marketing
› Time-to-degree patterns
› Coordinated leadership of graduate education and research
› Integrated outreach, development, alumni affairs and public relations
› Consolidation of department, college and administrative plans
› Diversity

“Diversity,” an area of concern since the 1989 study, has been an ongoing challenge for the institution.

Actions Taken

Enrollment

According to the 1998 accreditation review, “The institution has developed a great number of well-thought-out plans for enrollment growth, for retention, for marketing the institution but most of these plans have not been fully implemented nor fully integrated.” The 1999 HLC visiting team recommended a report be submitted in 2002 to provide evidence of campuswide enrollment management (recruitment and retention) efforts which Missouri S&T provided. The campus made strengthening enrollment, while enhancing the access and quality of the institution’s programs in engineering, science, business and the liberal arts the number one strategic plan goal in 2000. To meet that goal, the university established the division of enrollment management in June 2001. During its first six months the EM unit embarked on a reorganization/assessment plan and issued marketing reports assessing student retention, the challenges of attracting women and minority students in engineering and science fields, and opportunities to attract additional liberal arts majors. Staff in the new division then began planning and focusing on simplifying administrative processes, reallocating staff and budget resources to high priority areas, and discovering ways to improve services to both internal and external students/customers.

Implementation of the plan has led to remarkable growth. Missouri S&T’s student body has been growing steadily since 2000, when 4,626 students were enrolled. The fall 2008 student enrollment numbers represent a 38 percent increase over the fall 2000 enrollments. Fall semester 2008 enrollment at Missouri S&T stood at 6,371 after four weeks of classes — the highest enrollment for the campus in more than two decades. The university’s higher student retention rates, now at 87 percent for returning second-year students, along with a 74 percent increase in minority students and a 35 percent increase in female students, helped lift the enrollment beyond the university’s target goal for a total enrollment of 6,150 students set in 2006. Missouri S&T’s undergraduate enrollment now stands at 4,912 students, while the number of graduate students attending Missouri S&T is 1,459. Since 2000, enrollment growth has occurred in all categories: undergraduate (33 percent increase), graduate (57 percent), on-campus (31 percent) and in distance education programs (161 percent).

The university is pleased to have significantly increased enrollment while maintaining academic quality and increasing the diversity of the student body. The average ACT score rose to 27.4, keeping the university’s average student profile among the top 10 percent in the nation. The current student body comes from 47 states and more than 50 foreign nations. The university has subsequently set an enrollment goal of 6,550 students by 2011. In light of the predictions for fewer Midwestern higher
school graduates and the reduced student interest in the science and engineering fields, the university has embraced a stronger national and international recruitment program.

The strategic plan outlines additional goals for continued recruitment and retention of Missouri S&T students. The second objective of Missouri S&T’s strategic plan, “Broaden the Academic Portfolio and Increase Enrollment” includes the goals “Grow overall enrollment to 6,550 by 2011 with diversity that reflects the State of Missouri and the global environment in which we compete” and “Increase the overall graduate enrollment to 1,750.”

Decentralized Marketing

As noted in the 1998 accreditation review, “The operation of the campus is very decentralized and although this approach has a number of significant advantages, there is a critical need to draw together the campuswide themes to effectively and consistently represent the institution to the public. The 1998 Marketing Plan Report, which has not been implemented, offers some good ideas on how to meet this need.” Although the functions of communications/marketing, alumni affairs and development resided in a single division in 1998, their complementary efforts were far from coordinated. In 1999, the university conducted a market research effort as the first step in unifying the advancement and marketing platform. The study reinforced what recruiters, alumni, faculty, prospective and current students and opinion leaders have maintained for decades — that the Missouri S&T experience delivers a unique combination of dimensions that prepares students to solve the problems of a technological society, including

- Leading-edge academic preparation
- Practical, hands-on experiences
- Relevant career connections
- Supportive and engaging learning communities
- Opportunities to participate and lead

These five areas have served as the brand pillars for the integrated advancement effort begun by the vice chancellor for university advancement in 2003 to support Missouri S&T’s new centralized brand platform. Additionally, the university advancement division occasionally hires consultants and marketing teams to assist in developing appropriate marketing materials, campaign planning, and other such marketing activities for the campus.

Time-to-degree patterns

The 1998 accreditation review stated that “problematic time-to-degree patterns for undergraduates need to be addressed systematically by the faculty and administration. For example, with fewer than 10 percent of the freshman cohort completing a degree after four years and approximately 40 percent after five years, needed to be addressed systematically by the faculty and administration.” The 1999 HLC visiting team recommendations provided renewed vigor in campus recruitment and retention efforts. In addition to the division of enrollment management, the university established the office of undergraduate and graduate studies (which was further restructured into separate offices for undergraduate studies and graduate studies
in 2007) specifically to collaborate with the division of enrollment management on issues of retention and time-to-degree patterns. These combined efforts have generated phenomenal improvements. First- to-second-year student retention rates have gone from 82 percent in 2000 to 87 percent in 2007. This 87 percent retention rate has been sustained for the past four years. The six-year bachelor degree graduation rate has risen from 52 percent in 2000 to 64 percent in 2005 and 62 percent in 2008. Both rates are higher than the national average (approximately 53%) and are among the highest of all Missouri public universities.

Some examples of Missouri S&T retention strategies and tactics from 2001–2008 are listed below.

**Assessment Enhancement**

- Created standardized retention and graduation reports by gender and ethnicity and began measuring stop-out rate (students who withdraw and return), 2002
- Began annual retention audit of academic (cognitive) and demographic factors, 2001
- Instituted new-student survey in freshman Preview, Registration and Orientation (PRO sessions), 2002
- Re-instituted the Hogan Personality Index (HPI) assessment to track students by non-cognitive factors, 2002
- Revised withdraw surveys and interviews, 2002
- Started follow-up telephone surveys of non-returning students, 2002
- Began collection and campuswide distribution of freshman academic profile, specifically new-student survey data about expectations, social activities, GPA, ACT/SAT scores, 2002
- Revised student satisfaction and engagement assessments, Cooperative Institution Research Program and National Survey of Student Engagement, 2001
- Identified classes with very low student success rates, grade of D, F or Withdraw in 2001

**Programming: Advising, Tutoring, Learning Communities, Faculty Training and Support**

- Learning Enhancement Across Disciplines (LEAD) tutoring program expanded beyond physics classes, Fall 2002
- Joint Academic Management (JAM) sessions established, 2004
- Online tutor request program implemented, 2003
- Opening Week activities restructured around a group project activity, 2002 and 2003
- Expectations of student success addressed in all recruitment and orientation speeches, 2002
- Group building (making friends) and study skills addressed in all orientation and Opening Week activities, 2002–2003
- Advising program expanded with regular advisor training and awards, 2002
Created an expansion of Learning Communities and First-Year Experience Programs to address student academic skills development and social engagement through student life-oriented group events, 2002–2003
Expanded freshman pre-college “Hit the Ground Running” program to address student academic expectations
Created the Center for Pre-College Programs (CPCP) to expand the K-12 student workshops and science, technology, engineering, and mathematics (STEM) summer camps.
Created the Center for Educational Research and Teaching Innovation (CERTI): to address improving the Missouri S&T learning environment and student learning outcomes through collaborative learning, experiential learning, technology enhanced learning, and educational research practices
Expanded experiential learning programs by promoting student engagement through student design teams, undergraduate research (OUR expansion) and service learning
Implemented the Notification of Scholastic Probation Form, 2007
Established the undergraduate advising office, 2007
Developed the On-Track Academic Success Program to assist probationary and academically deficient students, 2007

Policy Changes
Incomplete grade time limit change, 2002
Repeat course GPA adjustment policy, 2002
Scholarship Reinstatement Policy, 2002
All BS degree programs reduced to fall between 124 and 128 hours, 2002–2003
Four degree programs most often requested by exiting students added: business, information science and technology, technical communication, and architectural engineering, 2002–2003

Coordinated leadership of graduate education and research
According to the 1998 accreditation review, “The institution needs to develop a means to provide coordinated leadership and advocacy for graduate education and research.” As part of the campuswide restructuring in 2007, the university divided the office of undergraduate and graduate studies to allow for increased centralization and leadership of the graduate program. The office of graduate studies, headed by the vice provost for graduate studies, now plays a distinct leadership role by (a) providing an office to coordinate the efforts of graduate coordinators and graduate staff of all Missouri S&T graduate programs, (b) providing guidance to the Council of Graduate Students and seeking their input to enrich graduate student experience, (c) advocating graduate student issues to the campus, and (d) working with other units at Missouri S&T to streamline various graduate life-cycle processes. Additionally, the office of graduate studies administers the chancellor’s graduate-level fellowships that are used to recruit students for doctoral studies at Missouri S&T.
The 1998 accreditation review indicated that Missouri S&T “needs to consolidate and more fully integrate the outreach program, development, alumni affairs and public relations.” As the Accreditation Review Committee pointed out in 1999, the functions of communications, marketing, alumni affairs and development were far from coordinated. The university reorganized these functions under the leadership of the vice chancellor for university advancement. The next three years were a time of close collaboration in efforts to align the campus and department strategic plans with the campus branding platform. Integration of these functions within the 60-member advancement division has been extensive. The most notable change has been the centralization of the communications departments (i.e., publications, public relations, electronic marketing communications and video production) under one director of communications. The advancement division now houses five departments: communications, KMST public radio, alumni relations, advancement services, and development. The managers of these departments work together using an agency model of marketing for the betterment of each project and customer, as well as the institution. The directors of the five advancement departments within the division work effectively and creatively side by side to accomplish the division mission (to increase interest, involvement and investment) and the university vision of becoming a top-five technological research university by 2011.
Consolidation of Department, College and Administrative Plans

The 1998 accreditation review indicated that “The institution needs to consolidate the common elements of the various department, college and administrative plans into one comprehensive institutional agenda that provides common identity and direction.” Missouri S&T first engaged in a strategic planning process in 1992. Various plans and methods for development have existed over the years, but the vision has remained consistent: Missouri S&T is Missouri’s Premier Technological Research University.

The Missouri S&T Strategic Plan, which complements the Strategic Plan developed by the University of Missouri System, is made up of four strategic objectives and 15 goals. Where appropriate, tangible target measures of success are proposed. This plan is supported by an annual campus tactical plan and individual department and unit plans. The Missouri S&T Strategic Plan is a living, evolving document. The campus will continue to monitor environmental changes affecting higher education to ensure Missouri S&T remains at the forefront of technological research universities.

Diversity

According to the 1998 accreditation review, “The accomplishments in attracting and graduating minority students remains below what should be expected by the institution.” As the Accreditation Review Committee pointed out in the 1989 and 1998 reports, attracting a diverse student body has been an ongoing challenge for Missouri S&T largely due to its strong engineering education academic focus, rural location and historic low engagement and interest of minority students desiring to seek degrees in engineering. While diversity continues to be a challenge, the campus has achieved some significant gains since the 2003 Diversity Initiative was launched by the enrollment management division. By 2005, Missouri S&T reached its strategic plan goal of a 10 percent minority student enrollment. In the fall 2005, 2006, 2007 and 2008 semesters, Missouri S&T welcomed its largest-ever classes of underrepresented students, while still maintaining the ten percent goal. Total minority student enrollment has grown by 74 percent (278 additional minority students) since 2000 and a 90 percent first- to second-year retention rate has been maintained. During the same time period, female enrollment grew by 35 percent (369 additional female students) and non-engineering majors grew by over 40 percent. In 2000, the American student population of American Indian/Alaskan Natives, Asian-Americans, Black, Non-Hispanic and Hispanic-Americans at Missouri S&T totaled 377. In 2008, the same group had a total population of 655. In 2000, total female enrollment equaled 1,050 , while in 2008 total female enrollment was 1,419. Due to ongoing success of the new diversity recruitment and retention programs, the campus’ new strategic plan increased the minority student enrollment goal to 13 percent of the total population and female student enrollment goal to 30 percent of the total student population. For a complete discussion of campus efforts to enhance diversity, see Chapter Three’s “Opportunities for Improvement” section.
MISSOURI S&T AT PRESENT

It is clear that Missouri S&T has undergone a major transformation from a university with dropping enrollments to a university experiencing phenomenal growth and becoming a top-five U.S. technological research university. As with any organization in the midst of growth, Missouri S&T must learn to manage change. This self-study provides a golden opportunity for Missouri S&T to evaluate where the university has been, its current status and significance, and how to best position itself for the future.

A key strategy for continual improvement as Missouri S&T moves toward its vision of becoming an institution with greater national prominence is the revised mission, vision, strategic plan and tactical plan it has instituted. These comprehensive institutional documents specify goals, strategies for meeting goals, and key performance indicators for measuring progress. They will guide the institution toward becoming a significantly stronger university in the near future.

ENDNOTES

2. http://www.mst.edu/orp/
1: CRITERION ONE
The organization operates with integrity to ensure the fulfillment of its mission through structures and processes that involve the board, administration, faculty, staff and students.
1: CRITERION ONE

> Missouri University of Science and Technology is guided by a clear mission, a vision for the future and articulated values. For many years now, the institution has focused on planning thoughtfully to achieve its mission and vision and to continue to improve its embodiment of the values it celebrates. The processes and policies by which the university ensures that it involves its major stakeholders and operates with integrity in compliance with federal, state and governing board laws and policies are well aligned with the campus’ mission, vision, and values. Through its strategic plan, the university has established its mission, vision and values, as well as its institutional strategic goals:

Mission
The mission of Missouri University of Science and Technology is to integrate education and research to create and convey knowledge to solve problems for our state and the technological world.

Vision
The vision of the Missouri University of Science and Technology is to be a top-five technological research university by 2011.

Values

Tradition: We are a diverse scholarly community of hard-working problem-solvers who draw inspiration, strength and pride from our history, our students’ success, and our entrepreneurial spirit.

Interdisciplinary Collaboration: We value the entire realm of human knowledge and seek to transcend conventional boundaries in the pursuit of our goals.

Inclusiveness: We encourage and depend upon mutual recognition and respect and the voluntary cooperative efforts of our diverse constituents to sustain a strong and cohesive scholarly community.

Excellence: We embrace academic integrity, exceptional results, and constant improvement in teaching, research, service, and economic development activities

Strategic goals are the comprehensive institutional objectives and a roadmap of ways to achieve those objectives. They are specific statements of intended future general and continuing results.

Missouri S&T first engaged in a strategic planning process in 1992. Various plans and methods for development have been written over the years, but the vision has been consistent: Missouri S&T is Missouri’s Technological Research University. Missouri
S&T reviewed and revised the current mission and strategic plan in 2007 when it adopted a structure without academic schools or colleges and changed its name from the University of Missouri–Rolla (UMR) to Missouri University of Science and Technology (Missouri S&T). The university also revised its vision to that of becoming a top-five technological research university by 2011. The new vision is goal-oriented and much better aligned with the envisioned future of the campus than was the previous vision statement.

Missouri S&T revised its Strategic Plan and mission in summer 2007. After conducting several open forums and sharing the plan with the Board of Trustees, 85 percent of respondents to a campus poll voted to endorse it. In August 2007, the campus shared the revised strategic plan with the Board of Trustees, whose members discussed and endorsed it at their September 2007 meeting. The UM Board of Curators approved the new mission in its January 2008 meeting.

The various departments and units within Missouri S&T have their own mission documents and strategic plans that are tied to the Missouri S&T Strategic Plan which, in turn, complements the Strategic Plan developed by the University of Missouri System.

Missouri S&T operates with integrity to the extent that the board, administration, faculty and staff members, and students all have the opportunity to comment on the organization’s mission and core set of values. The consistency of the university’s actions with these values determines the institution’s integrity. The concept of integrity is directly linked to a specific outcome: the vision of becoming a top-five technological research university by 2011.

**CORE COMPONENT 1A**

The organization’s mission documents are clear and articulate publicly the organization’s commitments.

Missouri S&T has expended a great deal of effort to construct and update mission documents that accurately reflect its nature, commitments and intentions. Missouri S&T’s current strategic plan is available online and has been distributed campuswide at meetings and events. All academic departments completed strategic plans, including mission statements, in spring 2006 and are revising them to fit the current campus plan.

**1A WHAT MISSOURI S&T DOES BEST**

Missouri S&T recognizes the need for change and growth for continual improvement. The organization revises its mission documents continually to stay current with environmental needs such as growing enrollment, reduced funding and technological advances. The current mission documents (mission, vision, values and goals) were developed based on the university’s 2007 strategic plan. Missouri S&T’s mission documents are publicly and widely distributed in catalogs, the student handbook, recruitment material and other brochures, the alumni magazine, and on the institution’s website. Some departmental mission statements are published on departments’ websites. For example, the engineering management and systems engineering departments’ website clearly communicates the mission to equip individuals with engineering and management expertise to prepare them to be leaders in the identification and solution of technical and organizational problems that are complex and...
ARo evolution. The displayed mission of the interdisciplinary Engineering Department is (1) to provide a high-quality learning environment, (2) to enable students to understand and practice the breadth of interdisciplinary engineering analysis and design, and (3) to prepare students to be productive members of an increasingly technological society and to work in an interdisciplinary environment. The mission statements of new student programs and the registrar’s office can be found online and are also published in the undergraduate and graduate catalogs.

Examples of mission and planning revisions include the admissions department7 yearly discussion of its mission at the annual all-staff retreat and the international affairs office’s8 yearly mission assessment.

1A WHAT MISSOURI S&T HAS LEARNED

An assessment of the demands of the technological world showed the need for new programs to meet the challenges of changing populations, globalization and technological advances. In response, Missouri S&T has developed a number of new degree programs in growing and emerging fields over the last 10 years.

Name Change and Logo Development Processes

Change requires a slow, deliberate process that involves all major constituent groups. For example, the process of changing the university name started with the university’s Board of Trustees, who recommended the change to the chancellor as a means of better describing the institution. A white paper and open forums educated various constituent groups (faculty and staff members, students, alumni, employers) about the reasons for the change and offered opportunities to suggest names. The campus set up a name change blog so people could comment on the suggested names and the process. An outside marketing agency evaluated the names that emerged from the surveys, focus groups, and interviews and suggested the best names. The chancellor’s cabinet made the final choice and communicated that choice to all constituents. Finally, the campus submitted the new name, Missouri University of Science and Technology, to the Board of Curators of the UM System for approval.

Once the board approved the new name, Missouri S&T developed new logo designs. A large Brand Identity Team, representing a cross-section of Missouri S&T constituents, evaluated logo designs and developed plans to change the brand image of the university. The Brand Identity Team presented several designs at open forums on campus and posted them on the university’s web site. Approximately 800 faculty, staff and students completed paper questionnaires and surveys. Team members also considered comments collected on the blog site through the fall 2007 semester before reaching a decision.

This collective discussion prompted some individual departments to better align their activities with their mission statements. The international affairs office expanded its mission statement to define its responsibilities for internal and external outreach services and to define primary internal and external customers. The information science and technology program created additional curricula in the areas of enterprise resource planning and human-computer interaction as a result of the
evaluation of its mission statement by faculty, students, alumni, and recruiters. Residential life found that its staff members were aware of the mission of the department and applied it to their decisions, but not always through intentional thought. The department plans to train staff in applying the mission to decision making.

1A OPPORTUNITIES FOR IMPROVEMENT

An important opportunity for improvement at Missouri S&T is formalizing the process by which all departments review their mission documents. A more formal process could include procedures for departmental review of mission statements to ensure that all mission statements are coordinated with the comprehensive university mission statement. In addition, departmental mission documents should be located at a consistent location on department websites to promote easier access. Improved Missouri S&T comprehensive and department mission documents will enable better communication of mission and assessment results. The documents should also more clearly identify Missouri S&T’s constituent groups, especially its target student community as part of its mission documents.

CORE COMPONENT 1B

In its mission documents, the organization recognizes the diversity of its learners, other constituencies and the greater society it serves.

Within its first strategic objective (to enrich the student experience), Missouri S&T’s strategic plan contains value statements regarding the diversity of its learners, other constituencies and the society it serves.

1B WHAT MISSOURI S&T DOES BEST

Missouri S&T actively pursues a diverse student body. The admissions office’s annual goals include specific wording on enrolling a variety of academic majors, academic levels, geographies, under-enrolled majors and under-represented populations. The computer science department has the specific objective of doubling the number of female students it enrolls over the next five years. The department of business and information technology specifically addresses increasing the number of under-represented students and a diversity of learners in its mission documents. It is also increasing interaction with foreign academic institutions in Oman, Sri Lanka, and China and is actively recruiting students from India and China. The department is also increasing funding opportunities for international students and offering more distance courses. Army ROTC actively recruits minority and female populations and tracks the diversity of its cadet battalion. The economics department’s mission statement specifically mentions the importance of demonstrating sensitivity to diversity among the students it serves. The engineering management and systems engineering department has a goal to develop its graduates’ awareness of the diversity they will encounter as they engage in their careers. The mission and goals of the international affairs department clearly articulate the importance of meeting the needs of a diverse constituency and the greater society that it serves. The mission statement and goals for the Applied Language Institute and the Intensive English
Program\(^2\) clearly state the importance of meeting the needs of a diverse constituency. Wilson Library's\(^5\) mission statement confirms its devotion to serving the information needs of its diverse patron base. The goal of student diversity programs\(^26\) includes equipping all students from diverse populations with the knowledge and skills needed to transition effectively into society. The mission of the Office of Undergraduate Studies\(^27\) recognizes the diversity of its learners, other constituencies, and the greater society it serves. The Writing Centers\(^28\) mission statement recognizes that its constituencies are diverse and have diverse needs. The mission statement of the Cloud and Aerosol Science Laboratory\(^29\) recognizes the need to advance the state-of-the-art of aviation emission research to promote the needs of the greater society. The chemistry department\(^30\) mission document states that it will produce the best research to meet the needs of the greater society. The physical education program\(^31\) recognizes the diversity of its learners in the breadth of its classes and seeks to serve the greater society. The physics department\(^32\) contribution to the Missouri S&T Strategic Plan addresses the diverse constituency that makes up the campus community and its role in the greater society it serves.

In addition to the efforts of individual departments and units, the strategic plan includes a goal to increase student diversity to reflect that of the state of Missouri and the global environment in which the university competes. The spirit of this effort is also reflected in the fact that retention and graduation rates among minority students are higher than for the student body overall.

**Progress Indicators**

The current tactical plan includes the following progress indicators used to measure goal achievement:

- On-campus enrollment (increase to 5,825 students)
- Distance education enrollment (increase to 725 students)
- Size of freshmen class (increase to 945 students)
- First- to second-year student retention (increase to 90 percent)
- Size of transfer class (increase to 320 students)
- Graduate student enrollment (increase to 27 percent of the total)
- Minority student enrollment (increase to 13 percent of the total)
- Female student enrollment (increase to 30 percent of the total)
- Number of pre-college students attending campus camps and academic workshops (increase to 1700 pre-college students)
- Student quality (e.g., class rank and entrance scores)
- Diversity of international enrollment
- Increase graduate enrollment to 1,750 students

Missouri S&T's strategic plan also includes the goal of increasing diversity of the faculty to better mirror that of the student body and the greater society. Specifically, the campus goal is to improve campus diversity by increasing the number of tenured and tenure-track female faculty members to 54 or more and the number of traditionally underrepresented tenured and tenure-track minority faculty members to 19 or more by 2011.

Missouri S&T departments also actively pursue a diverse faculty. The department of human resource services/affirmative action\(^33\) seeks populations of diverse
backgrounds by advertising available job openings on Missouri S&T’s website and in newspaper advertisements, professional journals, job-related websites, and other resources in efforts to attract a diverse applicant pool. It specifically uses media targeted towards minority populations when available. The information science and technology program specifically addresses increasing under-represented and female faculty in its mission statement. Its most recent hire was of its first female tenure-track faculty member.

Missouri S&T works continuously to incorporate consideration of diversity into its processes. Army ROTC teaches cultural awareness and the complex relationships developed among diverse cultures, religions, and sexes, training students to build teams that respect this diversity. New student programs addresses many societal issues during student orientation for freshmen and transfer students, including diversity issues. Physical education recognizes the diversity of its learners in the breadth of its classes and seeks to serve the greater society. Residential life addresses general diversity awareness, learning styles and the responsibility of leaders to give back to their community in its training programs.

1B WHAT MISSOURI S&T HAS LEARNED

Missouri S&T acknowledges the need to use a diversity of teaching approaches. In response to student feedback, the Applied Language Institute and Intensive English Program added technological components to their learning programs to aid in serving its diverse learners. Teachers have developed new teaching skills to implement new technologies. In assessing its training, residential life learned that students respond well to active learning and retain information learned through active learning better. As a result, the department restructured its training to be primarily interactive and has seen a higher retention of knowledge and better application of skills.

1B OPPORTUNITIES FOR IMPROVEMENT

To act on its commitment to preparing students to contribute to an increasingly diverse world, Missouri S&T needs to continue efforts to increase the minority and female representation among its student body, faculty and staff. In addition, Missouri S&T should formulate an action plan for recruitment and retention of minority and female faculty and formally document its processes and improvements achieved.
CORE COMPONENT 1C
Understanding of and support for the mission pervade the organization.

Missouri S&T recognizes that campuswide understanding of and support for mission documents are best achieved through the direct involvement of campus members in the mission development process and in university decision-making in general. As a result, the university has attempted to anchor the majority of its planning processes to its mission statements, thereby creating a unified focus that aligns efforts across departments and divisions. Alignment with this mission takes place from the level of the Board of Curators through the divisions and departments. At annual retreats and monthly meetings, departments review and adjust the various mission documents to more effectively align with the campus mission.

1C WHAT MISSOURI S&T DOES BEST

The university community was involved in developing the mission documents. The provost involved the entire campus community in revising the Strategic Plan in 2007 by conducting open forums to educate the community of the goals and how they align with the mission. Engaging the campus community required creating a representative committee of faculty members, staff members and administrators charged with writing new mission documents and a strategic plan in 2006–2007. The mission documents were posted on the campus website. Individual input and comments were posted on the website or solicited at open forums. A campuswide vote was conducted to determine whether or not the plan would be adopted. Many departments reviewed their mission statement at annual retreats or monthly meetings to make adjustments to align them with the new campus mission. For example, at annual departmental retreats in the enrollment management division\(^4\), the staff and director review the office mission statement to gain a better understanding of their role in the department as well as their division. The directors of the various departments in the enrollment management division also meet annually and review their mission statements. Several academic departments such as computer science\(^41\) and economics\(^42\) discuss their departments’ mission and goals at regular departmental meetings. Most departments print their mission statement in the undergraduate catalog\(^43\). All of the engineering disciplines have a section for the mission statement. The newly established business and technology management department\(^44\) revised the strategic plans of the two original departments that merged, creating a new strategic plan that followed that of the university.

Unit planning is mission driven. Annually, departments set goals that are aligned with their mission statements. For example, the Center for Pre-College Programs\(^45\) has annual goals to support the mission and programs.\(^46\) International affairs\(^47\) used the accreditation self-study to “review and evaluate the department’s attitude towards the campus and departmental mission statement.” The department has a feedback loop in place to do an ongoing evaluation of its mission and goals. The computer science departments\(^48\) goals are revisited at faculty meetings and at yearly evaluations during the process improvement cycle for the department.

Ideally, all university employees would clearly understand the basic mission and direction of the university. Training of new staff in some departments includes
immersion in the department's mission, along with collection of feedback on how to improve future training. For example, the residential life office has several training programs for their professional and student staff at the beginning of each semester.

1C WHAT MISSOURI S&T HAS LEARNED

Missouri S&T understands that its mission documents must continually evolve and that the entire campus community must be involved in mission and strategic plan development. Continuous input and review of individual department and unit missions contributes to this evolution.

1C OPPORTUNITIES FOR IMPROVEMENT

As noted in the "Opportunities for Improvement" section under Core Component 1A, while most departments are aware of the campus mission, some confusion remains about the strategic planning process and individual department and unit missions. Improvements could be made to formalize the strategic planning process and implement an annual review. A more formal process could include annual mission review at the department or unit level to increase individual awareness of the campus mission documents. Mission statements should be placed in a uniform position on each department or unit website to eliminate confusion. A standardized format for listing all department and unit missions in the undergraduate catalog adopting the format used for the engineering disciplines would minimize confusion. Adding a session on mission documents to new employee orientation would increase individual awareness of the mission.

CORE COMPONENT 1D

The organization’s governance and administrative structures promote effective leadership and support collaborative processes that enable the organization to fulfill its mission.

The University of Missouri System structure is clearly outlined in its global regulatory documents, the Collected Rules and Regulations, and the Missouri S&T campus structure is defined in the Faculty Bylaws that include General Faculty and the Faculty Senate and its committees. The Missouri S&T organizational structure, governance and resources are explained in this document’s “Introduction” section.

The shared governance of the campus is facilitated by cooperative communication efforts between the faculty and administration. An example of this communication would be open forums for discussion of issues presented to the campus. The 2007 restructuring to eliminate schools and colleges resulted in a thorough review and revision of all rules and regulations.

1D WHAT MISSOURI S&T DOES BEST

The Missouri S&T governance and administrative structure enables the chancellor to exercise effective leadership by granting him the authority to design administrative structures with the approval of the president and the Board of Curators. Under the current structure, the chancellor is primarily responsible for external affairs and the provost is primarily responsible for internal affairs. This division of duties allows
upper administration to lead more effectively and efficiently, fulfilling the university
mission and appropriately distributing responsibilities and decision-making.

An example of supporting collaborative processes through effective leadership is
the formation of the dean of enrollment management position in 2001. The action
brought together admissions, registrar, financial aid, pre-college programs, new
student programs, diversity programs, and women in engineering programs to more
effectively coordinate efforts. The impact of this reorganization is evident in increased
total enrollment and increased enrollment of minorities and women. The new posi-
tion and reorganization have also contributed to retention and graduation rates.

The university strongly supports leadership development. Department chairs and
other academic administrators attend the UM System President’s Leadership Devel-
oping Program (LDP) and staff directors participate in the Administrative Leader-
ship Development Program. Departments also encourage leadership development
through various teams and committees within their structure. Leadership experiences
are available to students through organizations in student life.

**1D WHAT MISSOURI S&T HAS LEARNED**

The governance of Missouri S&T works well and is aligned with the institution’s mis-
tion and vision. The Collected Rules and Regulations define the roles of the cam-
pus administrators and, along with the Faculty Bylaws, enable collaborative efforts
between the administration and the faculty. One example of faculty members and
administrators working together and sharing responsibility for the structure and
integrity of the campus was the Faculty Senate’s major review and revision of the Fac-
ulty Bylaws, the Student Academic Regulations, and the undergraduate and graduate
catalogs as a result of the campus restructuring. By reviewing the Faculty Bylaws and
other areas that are impacted by the campus restructuring, the organization con-
ducted a thorough evaluation and revision of campus structure and governance. The
chancellor’s office collaborated with the Faculty Senate by holding open forums for
most major issues facing the campus. For example, forums were held regarding the
campus restructuring, the revised Strategic Plan, and the campus name change.

**1D OPPORTUNITIES FOR IMPROVEMENT**

While most aspects of Missouri S&T’s governance work well and are aligned with the
institution’s mission and vision, communication could be improved. Prior to the reor-
ganization, departments relied on academic deans’ offices for information about plan-
ning and resource allocation. It is essential, given the new campus structure, that the
chancellor, provost and vice-provosts not only fill that void with timely updates, but
also engage department chairs fully in the planning and budget process. Information
is currently disseminated to the campus community via a network of teams and com-
mittees which also provide feedback to the administration. Examples of these teams
and committees include

- Chancellor’s Cabinet
- Chancellor’s Council
- Provost’s Cabinet
- Faculty Senate
- Graduate Faculty Council
A better coordinated communication strategy, perhaps utilizing "eConnection," the campuswide electronic communication system, could eliminate confusion and increase awareness of priority issues on campus while allowing administrators to collect additional feedback.

### CORE COMPONENT 1E

**The organization upholds and protects its integrity.**

Missouri S&T upholds and protects its integrity by abiding by the laws and regulations of the federal government and the state of Missouri, the policies of the Collected Rules and Regulations, Campus Guidelines, Student Academic Regulations, and other governing and regulating bodies and guidelines. Integrity is further ensured by internal financial audits and program reviews conducted by the UM System. In addition, UM legal counsel aids the university with explanations of regulatory requirements. Historical good practices and a lack of citations or investigations testify to Missouri S&T's integrity. 53

### 1E WHAT MISSOURI S&T DOES BEST

The Board of Curators ensures that Missouri S&T operates legally, responsibly and with fiscal integrity. Departmental integrity is additionally demonstrated through compliance with a variety of published policy documents and interaction with governing agencies. The Missouri S&T Archives59 follows the Missouri Sunshine Law by not destroying records that are regulated by the Missouri System Records Retention Guide. Missouri S&T’s human resource services/affirmative action department55 follows campus human resources collected policies, rules and regulations in addition to the UM System human resources policies and procedures. Clearly specified collected campus Rules and Regulations,56 Faculty Bylaws,57 and Student Academic Regulations58 all ensure integrity.

Feedback about the integrity of the academic programs is sought via surveys of graduates, industry comments on the preparation of the graduates,59 and the ABET accreditation process for the engineering disciplines. Integrity is also ensured through continued accreditation and affiliation with the HLC.

Professional standards set by a host of national organizations for faculty, staff and students are followed. Examples of such standards include

- Professional Engineering licensure procedures
- The Family Educational Rights and Privacy Act (FERPA), also known as the Buckley Amendment, guidelines for student privacy rights
- The National Collegiate Athletics Association (NCAA)60 standards for athletics
- Association of International Educators (NAFSA)61 Code of Ethics
Departments uphold their integrity by ensuring that students are provided with a course syllabus that outlines the course expectations and grading procedures. Departments also ensure that faculty members understand academic policies. For example, the economics and finance department regularly reviews matters of policy regularly in departmental meetings.

The university complies with legal requirements on a daily basis. For example, the department of environmental health and safety, the registrar’s office, the environmental management system and many other campus departments oversee compliance with federal and state laws.

The university responds in a timely manner to student complaints and student/staff grievances. For example, human resource services/affirmative action maintains clear policies regarding staff grievances. The office of undergraduate studies has established clear policies and procedures for student grievances and allegations of academic dishonesty. One of the traditional purposes of the office of the vice chancellor for student affairs is to serve as a student advocate. Student affairs has recently added a procedure, for example, to deal with student concerns about intellectual pluralism. It has created a process to address student or faculty concerns about being “disadvantaged or evaluated on the basis of their political beliefs.” In addition, most campus offices, such as the registrar’s office, have a generic email account that is widely available to students and response to which is given a high priority.

One of the five Missouri S&T values is “Excellence: We embrace academic integrity.” This value is presented to students and families by new student programs at the orientation visit, distributed during opening week, and read and discussed at the New Student Convocation in August. Academic integrity is also addressed in the Missouri S&T community standards, which include honesty, truthfulness, and preparing one’s own work.

1E WHAT MISSOURI S&T HAS LEARNED

Missouri S&T has a strong reputation for operating with integrity in the broadest sense of the word and strives to strengthen this attribute as it pursues its vision. Missouri S&T’s has a record of complying with applicable regulations with few internal complaints. Internal financial audits ensure the accuracy and honesty of the organization’s operations. Participation in external organizations and agencies, as well as professional groups, keeps the campus focused on operating to the highest level of integrity. The university impresses upon its students the importance of integrity by making integrity one of the formal values it describes to new students.

1E OPPORTUNITIES FOR IMPROVEMENT

In 2007, the office of sponsored programs created the position of research compliance officer. This officer faces the task of providing necessary oversight regarding compliance with the office of management and budget circular A-133.
SUMMARY OF FINDINGS

STRENGTHS
Missouri S&T operates with integrity to ensure the fulfillment of its mission through structures and processes that involve the Board of Curators, administration, faculty and staff members, and students. The university maintains a comprehensive set of mission documents, last revised in 2007, which are clear and publicly articulate the commitments made.

Missouri S&T mission documents recognize the diversity of learners, other constituencies, and the greater society served. Since the last accreditation report in 1998, Missouri S&T has adopted statements within its mission documents that strongly express the university's commitment to promoting diversity and multiculturalism. Actions taken include the creation of the positions of dean of enrollment management and vice provost for graduate and undergraduate studies. The significant gains made in increasing diversity on campus, especially in the areas of increased recruitment and retention of a diverse student body, reflect these commitments.

The Missouri S&T mission is largely understood and supported throughout the organization. The administration promotes effective leadership and supports collaborative processes that enable the organization to fulfill its mission. Missouri S&T upholds and protects its integrity.

CHALLENGES
While most departments are aware of the campus mission, some confusion about the strategic planning process and individual department and unit missions remains. Improvements could be made to formalize the strategic planning process, implement annual reviews, and regulate placement of mission information on campus websites. These actions would improve the communication and campus awareness of mission documents.

Missouri S&T has made great gains in student diversity, but is still far from achieving a diverse student body, staff and faculty for many reasons. Greater campus awareness of both progress and challenges in reaching diversity is needed. Progress could be greatly improved if more people saw diversity not as a series of initiatives for people from underrepresented groups, but as an initiative of concern to everyone on campus, much like our striving to attain academic excellence in our educational programs and service excellence in support units. Additional strategies to maintain diversity as a priority and develop or increase key performance indicators to track progress are needed.
ENDNOTES

1. http://chancellor.mst.edu/
4. http://accreditation.mst.edu/evidencecollection/criterion1/IDE_Criterion1%20Form.doc
5. http://pro.mst.edu/
10. http://namechange.mst.edu/
12. http://namechange.mst.edu/
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32. http://physics.mst.edu/
33. http://hr.mst.edu/
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35. http://campus.mst.edu/armyrotc/ms_courses.htm
36. http://pro.mst.edu/
37. http://reslife.mst.edu/
38. http://ali.mst.edu/
40. http://accreditation.mst.edu/evidencecollection/criterion1/Admissions_Criterion1Form.doc
2: CRITERION TWO
The organization’s allocation of resources and its processes for evaluation and planning demonstrate its capacity to fulfill its mission, improve the quality of its education, and respond to future challenges and opportunities.
2: CRITERION TWO

CORE COMPONENT 2A
The organization realistically prepares for a future shaped by multiple societal and economic trends.

● 2A WHAT MISSOURI S&T DOES BEST

> Through its strategic planning. Missouri University of Science and Technology is responding to a number of significant factors that impact all of higher education, but are particularly important to a technological research university. While many sources inform the planning process, the university community responds to the important dialogue on globalization and the role of science and technology in that process provided by two key publications. Rising Above the Gathering Storm: Energizing and Employing Regions, States, and Cities, produced by the Committee on Science, Engineering, and Public Policy in 2006, and Thomas L. Friedman’s 2005 book The World is Flat: A Brief History of the Twenty-First Century describe the challenges posed by an interconnected, global market place. Notable among them is the rapidly emerging strength of science and technology institutions of higher education beyond the United States. For example, institutions of higher education in Singapore, China, France and South Korea have a much higher percentage of students obtaining degrees in engineering and science than do institutions in the United States. ¹ This diminishing interest in engineering is particularly acute in Missouri. Only 1.3 percent of 2004 and 2006 high school seniors who had ACT scores of 24 or higher (upper 30 percent in the nation) were interested in engineering. ²

The challenge for an institution like Missouri S&T is substantial. In a world where technology will become increasingly critical for innovation and economic competitiveness, fewer American students have an interest in pursuing careers with a technological emphasis. Complicating the future for Missouri S&T is the decline in state support for higher education. In 2000, appropriations from the state legislature provided 42 percent of the campus revenue. Seven years later, that percentage had fallen to 28.³

Critical, then, to the campus planning process is the need to address all of the following factors: globalization, increased international competition in engineering and science education, diminishing interest among American students in technological careers, and declining state support.
Addressing the “Narrow Pipeline”

In 2005, Missouri S&T became the lead affiliate university in the state for Project Lead The Way. Working with St. Louis Community College and the University of Central Missouri, Missouri S&T is helping school districts in the state design a pre-engineering curriculum for middle school and high school students. Drawing upon a project-based and problem-based approach to learning, Project Lead The Way offers teacher training to school districts that seek to help students apply math and science principles in a pre-engineering curriculum.4

In summer teacher training programs in the past three years, Missouri S&T provided guidance in developing courses for both middle school students and high school students. This training program consists of eight courses: Introduction to Engineering Design, Principles of Engineering, Digital Electronics, Computer Integrated Manufacturing, Civil Engineering and Architecture, Engineering Design, Aerospace Engineering, and Biotechnical Engineering. In 2005, 33 school districts offered Project Lead The Way courses. In 2007, 71 districts offered the courses.5

Through coordination of the Center for Pre-College Programs, Missouri S&T has also developed 21 summer camps and residential programs to encourage greater interest in science and engineering with programs in aerospace engineering, computers, transportation, nuclear energy, business, robotics, wind power, water power, and explosives. Young students from grades one through twelve now have a wide variety of STEM programs to choose from. “It’s a Girl Thing” is designed exclusively for middle school girls. The campus also offers a one-day fall event called “Expanding Your Horizons” that targets junior high school girls for participation in a variety of hands-on projects. Several hundred participate in this one-day event each year.6

The numerous award-winning designs of the Student Design and Experiential Learning Center7, such as its human-powered vehicle and solar car, appear frequently at elementary and secondary school science-related events to help promote an interest in technology and science among K-12 students. In the 2007–08 academic year, well over 1800 young students participated in one of Missouri S&T’s pre-college STEM camps and workshops.

Missouri S&T also is seeking approval to offer a unique approach to science and mathematics elementary education in the state and to serve the needs of south-central Missouri with a proposed elementary education degree. This proposal, like much of the university’s planning, is in part a response to the call to action by the national academies in Rising Above the Gathering Storm to improve K-12 education in mathematics and science. The study notes, for example, that “about one-third of the 4th graders lacked the competence to perform even basic mathematical computations” and that “93 percent of students in grades 5–9 were taught physical science by a teacher lacking a major or certification in the physical sciences.”8 Due to Missouri S&T’s mission, the campus offers a unique educational environment for elementary education majors in science and mathematics, as well as in its strong programs in the social sciences and the humanities. Unique to elementary education programs in the state, the program would offer an engineering course for elementary education majors. Technology in Elementary Education will enable elementary education majors to plan and test grade 1–6 math and science activities incorporating engineering approaches to problem solving.9
PROMOTING A GREATER UNDERSTANDING OF GLOBALIZATION

Global Service Learning Opportunities

In 2004, Missouri S&T formed a chapter of Engineers Without Borders. Each year since, students and faculty members have traveled to Latin American nations to help residents rebuild homes after earthquakes, drill wells, build clean water showers, assess wastewater management needs, and develop improved filtration systems for drinking water. The aim of Engineers Without Borders is to implement "environmentally, equitably, and economically sustainable engineering projects while developing internationally responsible engineers and engineering students." Similarly, students in the Women as Global Leaders class have become involved in sharing their expertise with residents of Guatemala. In 2005, the students conducted a water use survey and evaluated gender roles in a Guatemalan village.

Course Work Dealing with Globalization

Beyond courses in the humanities and social sciences that have always tended to contain a strong global component, the campus has begun to develop courses in the engineering disciplines that address globalization. Some of the students in an international engineering and design course in geological engineering participate in Engineers Without Borders projects. The Residential College offers a global entrepreneurship class and the department of engineering management has sought to help students meet the challenge of globalization for some time through a project management course that included distance learners and on-campus students. The professor engaged one virtual team in studying a foundry near Mexico City and another "planning a robotic powertrain-fastening operation in Australia."

Study Abroad Opportunities

Missouri S&T has entered into agreements with dozens of international universities to offer student exchanges. The most popular has been the Missouri London Program which offers semester-long or three- and six-week summer sessions. The university has also developed faculty exchange programs, notably with the University of Western Cape in Cape Town, South Africa. Currently only about three percent of the university's graduates report having participated in a study abroad experience.

Seeking Greater Diversity

The campus Strategic Plan has committed Missouri S&T to increasing the enrollment of female, minority and international students and the number of female and traditionally underrepresented faculty members. This effort is part of the second strategic objective to "Broaden the Academic Portfolio and Increase Enrollment." A key component in that objective is the goal of increasing the campus diversity to better reflect "the State of Missouri and the global environment in which we compete."

Enrollment Strategies

Four daunting challenges face the enrollment management division at Missouri S&T. The proportion of high school students interested in natural science, computer science and engineering is falling to an all-time low. Also, while college-bound students are increasingly female and ethnically diverse, Missouri S&T has historically had
difficulty recruiting both female and minority students. The reality that in the state of Missouri the number of students graduating from high school is projected to fall every year from 2009 to 2014 further complicates matters. Finally, among its eight bordering states, only Illinois has higher tuition and fees than Missouri.14

The admissions department, which played a critical role in the resurgence of enrollment on the campus in the past seven years, has developed a number of strategies to respond to these challenges. The department draws upon a variety of industry surveys and reports to better understand the demographic challenge and the most likely sources for new enrollment. The staff’s analysis of “demographic shifts, high school student enrollments, studies on interest in engineering, science and other technological fields, the national data on gender and ethnic representation in particular majors, as well as national data on high school student preparation” led to a critical conclusion. Missouri S&T already attracts a very high percentage of Missouri students who have an ACT score of at least 24 and have expressed an interest in engineering. In 2005, for example, Missouri S&T enrolled 73 percent of that cohort. Missouri S&T, beyond extending its recruiting reach, must “diversify the academic portfolio… in order to meet goals for revenue generation, diversity of gender, ethnicity, and geographic distribution.” In 2008 the admissions department placed regional recruiters in three potentially important markets: Dallas, Chicago and West County St. Louis.15 Broadening the “academic portfolio” is a key part of a second strategic objective. Specifically, “Missouri S&T will balance the academic portfolio and the student experience by increasing market share in areas such as life sciences and biotechnology, energy, computing, business and management, communication, the liberal arts, and education in science, technology, engineering and mathematics.”16 This strategy is intended to contribute to maintaining a healthy undergraduate enrollment.

Restructuring Campus Administration

To enable the campus to more quickly respond to the imperatives of globalization and the changing demographics of the potential student population, the university made a fundamental change in its administrative structure. After several decades of having the school of engineering, the school of mines and metallurgy, and a College of Arts and Sciences, Missouri S&T decided to eliminate those administrative units in 2007. Besides streamlining the institution’s structure and encouraging more interdisciplinary research and teaching, the restructuring was undertaken to enable Missouri S&T to respond more nimbly to the powerful economic and societal trends affecting its future.

In a transparent and open process, five committees of faculty members, administrators, and staff members — financial activities, personnel resources, external functions and activities, administrative, and a steering committee — conducted public meetings and developed websites to keep the campus community informed. After these committees made their recommendations, the chancellor solicited public comments before announcing the elimination of the schools and college and placed their administrative responsibilities in the hands of four vice provosts.17

Changing the Name of the Institution

The campus made one additional change to enhance the effort to respond to the significant changes affecting higher education. In an effort to better differentiate
the campus from the other UM campuses, reflect the university’s national mission, enhance the university’s reputation, and broaden the campus’s market share of the nation’s best students, the University of Missouri–Rolla (UMR) became Missouri University of Science and Technology (Missouri S&T) on January 1, 2008.

2A WHAT MISSOURI S&T HAS LEARNED

Understanding Current Capacity

It is going to be critical that the campus maintains the quality of the institution as it continues to increase its enrollment. A 2005 assessment of classroom capacity, building renovation and construction master plans, parking, and Residential Life plans indicated that the campus can sustain continued, limited growth in undergraduate enrollment. This assessment included an analysis of classroom inventory, peak periods of classroom and laboratory use, the number of rooms in residence halls, Greek houses, and university approved apartments, and parking spaces. An analysis of the student market was equally critical. Given its current facilities and resources, the university should be able to effectively support an enrollment of 5,800 to 6,000 students on the Rolla campus. Acknowledging diminishing student interest in engineering, the campus seeks to maintain an undergraduate student body with 65 percent majoring in engineering, 15 percent in business and information sciences, and 20 percent in arts and sciences disciplines. That projected student profile appears realistic given that the campus offers degrees in the top 10 non-engineering majors. Thus, the Strategic Plan goal of a total of 6,550 students by 2011 is one that can be achieved.

Departments’ Response to the Changing Needs of Students and Employers

Departments across the campus routinely consult with a variety of constituents to make sure their programs are meeting the needs of their students and the students’ employers. They also seek to keep their curriculum “in line with global changes” in their disciplines. Beyond conducting exit interviews with students and meeting regularly with advisory boards, most departments survey their alumni and the employers of their students. For example, in 2006, mining engineering obtained information from “33 separate companies and agencies” and consulted twice with their development board for “insight into the economic and societal state of industry.” Faculty members also draw upon the recommendations of their professional societies to learn about the needs of the industries they serve.

The campus is also changing to reflect the way students learn. Wilson Library, in response to the demands of students and faculty for ever-greater access to electronic sources of information, is “expanding accessibility and findability of electronic content” of research materials. Moreover, the increased dependence of students and faculty on computers led the library to install a “walk-in” IT help center in 2007. “Recognizing trends toward student-centered learning environments,” the library opened a coffee shop in 2008. Information technology likewise is seeking to adapt to the ways students wish to access learning materials. One good example is the Blackboard course management system which “allows students to access course material anytime, take tests and hold online discussions with professors and other students all from a distance.” More generally, the Center for Educational Research
and Teaching Innovation (CERTI)\textsuperscript{23} seeks to assist faculty members’ understanding of the importance of integrating “collaborative, experiential, and technology-enhanced methodologies” with “effective assessment techniques” to help students more readily achieve learning outcomes.

\section*{2A OPPORTUNITIES FOR IMPROVEMENT}

The campus’ ability to respond positively to the many changes affecting higher education in general and this campus in particular will depend upon its access to the requisite resources. Having adequate qualified faculty and facilities is essential. This reality underscores the need to maintain not only growth in enrollment, but also maintain the progress of the last seven years in retention rates. It also places particular emphasis upon a successful capital campaign and increasing externally funded research.

\section*{CORE COMPONENT 2B}

The organization’s resource base supports its educational programs and its plans for maintaining and strengthening their quality in the future.

\section*{2B WHAT MISSOURI S&T DOES BEST}

In recent years, the university has invested substantial time and resources in faculty, staff and technology to improve the educational quality of the institution.

\subsection*{Faculty and Staff Development}

The campus, in conjunction with the University of Missouri System academic affairs office, has devoted much effort to faculty and staff development in recent years. A year-long New Faculty Forum, through a series of workshops, provides information on campus resources and explores ways to enhance research proposals and improve teaching. The University of Missouri System provides professors in their second through fourth years an opportunity to participate in a series of forums, workshops, and \textit{conferences on innovative teaching}.\textsuperscript{24} Beyond these efforts, most academic departments at Missouri S&T provide a faculty mentor or a committee of mentors to assist new faculty members with both their research and teaching responsibilities. The University of Missouri System has also invested heavily in a leadership development program since 2000. The University President’s Academic Leadership Institute has included 62 Missouri S&T participants since 2000 and the President’s Administrative Leadership Institute has taken 12 from Missouri S&T in its first two years. These programs, which include four-day retreats, day-long sessions, and monthly luncheons, have focused on mid-level administrators like department chairs and unit directors in an effort to \textit{help develop the academic leadership potential of the University of Missouri for the future}.\textsuperscript{25}

Beyond supporting the leadership development program for staff, for more than a decade the campus has also provided a significant discount in tuition and fees for staff to take courses and pursue degrees. Also, many units have \textit{supported their staffs with professional development funds}.\textsuperscript{26}
Technology
Missouri S&T has invested heavily in improving its instructional technology. Beyond maintaining and updating computers in labs around the campus, the Information Technology Department has equipped each centrally scheduled classroom with a computer, network connection, and a projector, enabling all teaching faculty “to enhance instruction and delivery.” The department also continually updates Blackboard, a course management system that “allows students to access course materials anytime” and, in some cases, hold “online discussions with professors and other students all from a distance.” The campus also implemented PeopleSoft software, an integrated administration computer system for human resource services/affirmative action, and Missouri S&T faculty and students. In collaboration with the Center for Educational Research and Teaching Innovation (CERTI), which has hired an instructional design specialist, IT has hired an education technology specialist who works to upgrade classroom technology, personal response (clicker) systems, Blackboard support, and a Virtual Learning Environment."

Office of Undergraduate Studies
The mission of the office of undergraduate studies, established in 2001, is to “Improve the learning environment, and enhance the learning outcomes of students.” The office offers an array of programs to improve student retention. It also administers a number of critical units on campus, including the Freshman Engineering Program, the South Central Regional Professional Development Center, the Student Design and Experiential Learning Center, and the Writing Center. The office has established several recent key initiatives including the creation of an undergraduate advising office and an “On-Track Academic Success Program” in 2007 to assist probationary and academically deficient students.

* 2B WHAT MISSOURI S&T HAS LEARNED

The campus, through a variety of strategies, has been able to develop the resources to provide an excellent learning environment, despite extraordinary financial challenges. Since the Higher Learning Commission’s last accreditation in 1999 Missouri S&T has faced substantial challenges in securing the resources essential to maintain a quality learning environment. Whether considering the one-year, two-year, five-year, or 10-year percentage change in state tax appropriations for public colleges and universities, Missouri trails the national averages significantly. For example, from 2002 to 2007 nationally there has been a 24.1 percent increase in state appropriations for public higher education. In Missouri, however, the percentage has been only 6.8 percent.

State appropriations for the campus peaked in the 2001 fiscal year at $50,642,834. They dropped nearly $6 million the following year and have slowly increased since. Still, state appropriations were only at barely $46 million in Fiscal

Table 3: AMOUNT OF MONEY APPROPRIATED and THE PERCENTAGE OF TOTAL CAMPUS REVENUE

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<tr>
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<th>FY00</th>
<th>FY01</th>
<th>FY02</th>
<th>FY03</th>
<th>FY04</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
<th>FY08*</th>
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</thead>
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<tr>
<td>Dollars (in millions)</td>
<td>47.9</td>
<td>50.6</td>
<td>44.7</td>
<td>45.9</td>
<td>44.4</td>
<td>44.8</td>
<td>45.1</td>
<td>46.0</td>
<td>48.3</td>
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<tr>
<td>% of Total Revenue</td>
<td>42</td>
<td>41</td>
<td>38</td>
<td>34</td>
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<td>30</td>
<td>29</td>
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[Current Fund Revenue Actual From Financial Statements] * Estimate 3/31/08
Year 2007. Exacerbating the financial problems facing the campus was the increase of almost $5 million in the cost of faculty and staff benefits and the nearly $1 million increase in fuel and utilities expenses. The campus has adopted several strategies to address the problem including budget reductions and voluntary retirement incentives.

Budget Reductions

The campus made some essential cuts and in other cases froze budgets for a year or two. In fiscal year 2002, the campus cut departments’ expense and equipment budgets and those budgets saw no increases in the following two fiscal years. Also, in fiscal year 2002 the campus eliminated the Mission Enhancement fund allocation which had been intended to fund new initiatives in the sciences and engineering. The campus cut the building and repair funding rate from 1.5 percent of the building replacement value to 1.25 percent. Research centers also saw cuts in direct support from the campus. The campus reduced some reserve funds as well. For example, in the 2006 fiscal year budget the chancellor reduced his reserve fund. Several administrative and academic units also faced cost reductions. Beyond all these reductions, the campus responded to a University of Missouri System mandated $1.1 million reduction in administrative expenditures. These cuts affected all administrative units.

- Academic Affairs $325,000
- Administrative Services $200,000
- Enrollment Management $50,000
- Extended Learning $75,000
- Information Technology $200,000
- Sponsored Programs $100,000
- Student Affairs $150,000

Voluntary Early Retirement Incentive Program (VERIP)

The 2002 VERIP plan, available on all campuses in the UM System, offered an early retirement to staff and faculty whose age and eligible service to the university, when added together, totaled at least 85. This permitted the campus to reduce the number of faculty and staff positions without resorting to involuntary severance. The program also produced some savings through the creation of open positions that the campus did not immediately fill.

Slow Salary Growth

Faculty and staff faced slow growth in salaries between 2001 and 2007. Not only was there no general increase in fiscal year 2003, increases between 2005 and 2007 were only 2 percent.

Tuition and Fee Increases

Between Fiscal Year 2001 and Fiscal Year 2007, the campus increased undergraduate resident student fees by 66 percent and of out-of-state student fees by 39 percent. Similar increases were made in graduate student fees. New supplemental fees for business and science courses accompanied the other increases. After a four-year increase to 34 percent in 2002, over the next five years the campus lowered the
discount rate to 28 percent, which was the prevailing rate in 1998. With enrollment increasing by 23 percent, the fee increases and the diminishing discount rate led to a net 86 percent increase in income from tuition and fees. This effort was a critical factor in maintaining the campus’s financial stability. In fiscal year 2000, tuition and fee income was 30 percent of campus revenue. Seven years later it was 36 percent of campus revenue.

Sponsored Research
Since Fiscal Year 2000, sponsored research has been an increasingly important part of campus revenue. The total in grants and contracts has risen from $18.4 million to $37 million in fiscal year 2007. That comprises 20 percent of campus revenue. The indirect cost funds recovered from grant and contract expenditures have become vital in advancing research across the campus. These funds provide release for “faculty serving as center directors from some of their academic duties,” “cost sharing on proposals with departments,” help with “start-up packages for new faculty,” help with campus “infrastructure needs” and the “Fort Leonard Wood liaison officer.”

Gifts and Endowments
Following a successful Full Circle Campaign in 1994–2000 that exceeded its $60 million goal by nearly $8 million, the university advancement division engaged in a $200 million Advancing Excellence capital campaign. This campaign focuses on providing investments in emerging technologies like biotechnology, preparing students for careers in a global workplace, and enhancing the core programs of the campus. This campaign will likely produce an increasing proportion of campus revenue. In Fiscal Year 2000, gifts and endowment income, which totaled $5.4 million, made up 5 percent of campus revenue. Seven years later, gifts and endowment income totaled $10.6 million and made up 7 percent of campus revenue. Alumni support has been critical to some departments. The geological sciences and engineering department, for example, drew upon contributions from their alumni to develop a “high-technology multimedia classroom.” The mining and nuclear engineering department works closely with the development office to create more endowed chairs and professorships and fund the “refurbishment of several laboratories.” The Student Design and Experiential Learning Center raises half of its “operating funds from outside sources who strongly support experiential learning.”

Department Collaborations and Efficiencies
Some departments have dealt with the financial difficulties of the past few years by collaborating with other departments or units on campus. The biological sciences department, for example, “added a renovated teaching laboratory in cooperation with the chemistry department.” In 2007, the Center for Educational Research and Teaching Innovation (CERTI) partnered with the office of distance and continuing education “to hire a full time instructional designer for face-to-face and distance courses.” The admissions office, which holds monthly budget meetings to review expenditures and reallocates resources based upon an analysis of the market for students, often collaborates with alumni relations, the development office, student diversity programs, and various academic departments in recruiting events to more effectively allocate “scarce resources.” Some departments, such as interdisciplinary...
engineering\textsuperscript{47}, have built “contingent balances…for start-up funds for new faculty” over several years. Other departments, like engineering management\textsuperscript{48}, have drawn from a combination of “state funding and soft dollars generated by departmental research and distance education activities to fund all departmental initiatives.”

The restructuring of the campus administration, which resulted in the merger of some departments, is another example of collaboration. The departments of business administration and information science technology merged. This action “strengthens the perception and the reality of the department's intent to combine business and information technology to the end of creating graduates who can understand both the integrated business functions and the information technology side of business.”

**2B OPPORTUNITIES FOR IMPROVEMENT**

While the numerous strategies adopted by the campus have been sufficient to maintain a high-quality learning environment, some serious strains on the institution need to be addressed.

**Faculty Salaries**

Faculty members at Missouri S&T, as well as those at the three other institutions in the University of Missouri System, have struggled with only slight salary increases in the past several years. While percentage increases in average salaries across the nation in the twenty-first century have been above 4 percent a year, faculty members at Missouri S&T have seen an average of just under 2 percent annually from 2002 to 2007\textsuperscript{49}. The university's Board of Curators has expressed concern about the combination of “small UM salary increase budgets” and “greater salary increases in the higher education marketplace” which “have caused the university's market position to erode.” Board members have concluded that the university has reached a critical stage and fear that the institution may not be able “to attract and retain quality faculty and staff.” Indeed, an analysis of faculty salaries at AAU universities finds the university's consistently trailing that elite group of universities. To address this “tenuous” situation, the Board of Curators included in the 2009 operating budget a “competitive compensation program for ranked faculty,” in part, by reducing the “university's required contribution to the retirement plan trust fund…because of the fund's strong investment performance during the last few years.”\textsuperscript{50}

**Laboratories, Faculty and Staff Needs**

While the campus has made notable improvements in educational technology, problems with the state of laboratories persist, notably in science departments where the teaching facilities are in some cases “substandard.”\textsuperscript{51} Likewise, some non-academic units are struggling with inadequate resources. The staff of counseling and academic support programs\textsuperscript{52}, who provide counseling services to students, faculty, and staff can provide help “only when situational exigencies require” due to ever-increasing client demand. Some academic departments are in a similar situation, notably mathematics and statistics\textsuperscript{53} where “the department's resource base is insufficient.” Each academic year the department relies on about $200,000 in miscellaneous instruction funds to handle “basic instructional responsibilities” by hiring “GTAs and part-time lecturers.” The latter example illustrates the biggest challenge for the campus and the continuing financial stresses it faces. While Missouri S&T has successfully recruited
more students and is retaining increasing percentages of them, the campus has been unable to proportionately increase the number of faculty. Between 2002 and 2006, both on-campus and total enrollment grew by 11 percent, but the number of full-time faculty members grew only 5 percent and the number of part-time faculty members, including graduate assistants, fell by nearly 8 percent.

CORE COMPONENT 2C
The organization’s ongoing evaluation and assessment processes provide reliable evidence of institutional effectiveness that clearly informs strategies for continuous improvement.

Missouri S&T has engaged in progressively more formalized evaluation and assessment processes over the past two decades. Campus strategic planning practices have focused on the coordinated inclusion of systemwide strategic objectives, Missouri S&T global strategic objectives, and campus departments’ and programs’ planning for continual improvement.

WHAT MISSOURI S&T DOES BEST
Present Institutional Evaluation and Planning Process for Achieving the Mission and Continuous Improvement
The evolution of planning, evaluation and assessment processes at Missouri S&T has led to several important outcomes: the implementation of a provost-appointed campuswide strategic planning committee, the organization of a campuswide institutional assessment committee, and the engagement of the entire campus in the strategic planning and accountability processes.

Strategic Planning Committee
Although Missouri S&T has been engaged in universitywide planning processes from various perspectives over the decades, it currently utilizes a provost-appointed Strategic Planning Committee to engage the campus collaboratively in a deliberate consideration of the institution’s mission and needs-based objectives and goals that support continual improvement and progress toward achieving its mission.

The present 19-member Strategic Planning Committee, which is made up of student, faculty, staff, and administrative representatives, has deliberated in monthly meetings. In these meetings, tactical planning occurs, priority processes are implemented, and progress is made toward achieving the institution’s mission.

The strategic planning process and the manner in which it is communicated to the campus community is important to maintaining an appropriate level of organizational ownership and accountability. The provost maintains a website to provide the campus community with summaries of the planning process. In addition, the chancellor gives bi-annual “State of the Campus” reports to describe how the campus is achieving its mission.

Institutional Assessment Committee
The campus’ Strategic Plan goal to “Develop an institutional culture of continuous improvement and regularly assess student outcomes” has resulted in the
establishment of a tactical plan action item to “Create a universitywide student learning assessment and continuous improvement committee.” Setting this priority has motivated the campus to examine assessment best practices and purposefully begin to consolidate the required assessment of ABET accredited engineering programs, accredited science programs, the accrediting process for the business program on the campus, and various departmental self-studies and individual faculty and staff assessment practices. The need to learn more from our current practices and develop continual improvement strategies is the primary expected outcome of the institutional assessment effort.

The campus’ institutional research and assessment office serves as a significant resource for anchoring a campuswide assessment engagement practice. Under the auspices of the provost, the institutional research and assessment office and the provost-appointed Institutional Assessment Committee will provide guidance for the campus in achieving the assigned goals of the committee.

The initial charge given to the Assessment Committee is to articulate and develop the campuswide assessment policies and procedures within the context of the university strategic plan for improving student learning outcomes and fulfilling the accountability mandate. The committee will identify the assessment efforts in various departments, identify gaps in assessment and reporting strategies and ensure that the assessment information is incorporated into decision making for program and curricula improvement and finally, develop a campuswide assessment plan.

In essence, the committee will:

- Define student learning outcomes for the university
- Define ways to measure the outcomes
- Evaluate whether outcomes have met the learning goals
- Recommend improvements to the student learning outcomes process

Campuswide Strategic Planning and Accountability

Missouri S&T continues to integrate simultaneously the requirements of administrative reorganization, a university name change, ABET accreditation self-study preparations for its engineering and applicable science programs, and a new round of institutionwide strategic planning.

Evidence supporting the institution’s evaluation and assessment processes that, in turn, inform planning toward meeting its mission and its commitment to continual improvement is drawn from all of the institution’s units, including the administration, administrative services, the division of enrollment management, departmental academic programs, and academic resource support services. The university archives, the information technology department, Wilson Library, the institutional research and assessment office, and the development office (through the KMST public radio station) serve as important repositories of “mine-able” current and historical data, which is indispensable to universitywide assessment processes.

Accountability

To manage the institution’s auditing and data analysis processes, Missouri S&T’s enrollment management division, the accounting/fiscal services office and the environmental health and safety department uses university system-wide data/
information management mechanisms such as PeopleSoft, Cognos, Hobson’s Connect2 and ACT’s EIS and AIM data and reporting systems.

For example, the enrollment management division has effectively used these mechanisms to establish an actively evolving and progressive strategy for student recruitment in response to the challenges of the predicted trend of pre-college students’ declining interest in science and engineering disciplines. Coordinated efforts including prospective student contacts, student admission, student pre-registration and orientation and new-student engagement have contributed to Missouri S&T’s experiencing a large growth in engineering, science and computing students, counter to national trends. Between 2000 and 2008, the total student enrollment has grown by 38 percent (Fall 2000, 4,626 students enrolled) to a Fall 2008 enrollment of 6,371 students with the third largest (1,056) freshmen class in the university’s history, exceeding most of the strategic goals.

The institution continues to improve Missouri S&T student achievement and success through the student affairs division, undergraduate studies, graduate studies, extended learning, and academic department programs that consider the roles of students, faculty and staff.

The student affairs division, which encompasses student life, residential life, the Career Opportunities Center, and counseling and academic support programs, has effectively utilized surveys of participation in division programs to provide information about the division’s effectiveness in fulfilling its goals for student citizenship, leadership, personal and professional development. The division’s effectiveness and continual improvement is reflected in regional and national recognitions for student life and residential life programs.

The undergraduate studies division evaluates each of the programs that contribute to its mission annually in an effort to improve student retention and graduation rates. Programs that focus on student academic success and engagement utilize student surveys and directly measured program outcomes to inform new program development and continual improvement strategies. Generally, these programs include living and learning communities, advising, academic resources, experiential learning, and faculty development. For example, the Missouri S&T Honors Academy has a strategic plan and an accompanying assessment plan which are reviewed annually and result in annual program adjustments. Since the reorganization of the undergraduate studies office in 2001, its programs have positively contributed to the retention of first-year students, increasing retention from 83 percent in 2002 to 87 percent in 2007. A goal of 90 percent first-to-second year student retention has been established for the 2010–2011 academic year.

The institution’s 20 academic departments utilize a variety of ongoing evaluation and assessment processes to ensure program effectiveness and improve quality. These processes include advisory board/alumni reviews, monitoring of student graduate success, student course evaluations, program accreditation and certification agency reviews, periodic program self-studies, student exit interviews, and regional discipline-specific professional association reviews, as well as the traditional classroom evaluation and assessment practices.

These practices have led many departments to adopt new practices that improve learning environments and to revise student learning outcomes. These improvement strategies have included the adoption of the in-class student personal response
systems or “clickers” (handheld personal-response devices that are used by students to answer polling and quiz questions given during class in modified PowerPoint presentations), online classroom management tools, and teaching seminars. Most departments also report increases in the number of majors and higher placement rates.

**2C WHAT MISSOURI S&T HAS LEARNED**

Missouri S&T has designed and coordinated planning and included all constituencies from across the institution to communicate, engage and evaluate programs and processes. The campus has learned that continual improvement is essential for accountability throughout the institution.

For example, in the administrative services division, The environmental health and safety office utilizes a deliberate “plan-do-check-act” strategy to maintain documented procedures for monitoring and measuring university processes that significantly impact the environment. These procedures include the recording of information to track performance relative to operational controls and conformity with the university’s objectives and targets. Since 2001, the university has maintained ISO 14001 certification for its environmental management system (EMS). Missouri S&T was the first four-year public institution in the United States to establish a certified EMS. By design, this international standard engages organizations to go beyond compliance and seek continual improvement as a daily operational practice.

**OPPORTUNITIES FOR IMPROVEMENT**

Missouri S&T must continue to improve communication about the engagement in and progress of the campus community in achieving the objectives of the strategic plan and allocating resources to support achieving goals. Missouri S&T must improve programs that enhance students’ written and oral communication and problem-solving skills. Also, Missouri S&T must improve its process for evaluating graduate programs.
CORE COMPONENT 2D

All levels of planning align with the organization’s mission, thereby enhancing its capacity to fulfill that mission.

Since 1992, Missouri S&T has employed an evolving practice of strategic planning. Initially, the process principally involved two engineering deans and the dean of the College of Arts & Sciences collaborating with the campus’ executive leaders. However, the process now resembles that of the Malcolm Baldridge National Quality Award involving key representatives of each operating unit across the university. The university received the Missouri Quality Award in 1995. This award is patterned after the Malcolm Baldrige National Quality Award, and it is intended to stimulate the practice of quality management, with an emphasis on continuous improvement and economic development. Currently, the chief information officer, dean of extended learning, dean of enrollment management, office of technology and economic development, vice chancellor for student affairs, vice chancellor for university advancement, vice provost for academic affairs, vice provost for graduate studies, vice provost for research, vice provost for undergraduate studies, Faculty Senate representative, chair of the Department Chairs Committee, and representatives of the Accreditation self-study steering committee serve as a provost-appointed Strategic Planning Committee.

2D WHAT MISSOURI S&T DOES BEST

Strategic Planning and Budget Coordination Process

The campus initiated the present strategic planning process in fall of 2006 by appointing a Strategic Planning Steering Committee (SPSC) presided over by the provost. The SPSC members, who were responsible for the achievement of strategic objectives and goals across the institution, developed an initial set of objectives and goals and communicated them to the campus while seeking input. Campus adoption of the strategic plan led to the development of a supporting annual campus tactical plan, as well as individual department and unit plans. Integrated into the university’s strategic plan are its mission, vision and values statements, which are supported by four objectives and 15 goals. The mission of Missouri University of Science and Technology is to integrate education and research to create and convey knowledge to solve problems for our state and the technological world. The four objectives, “Enrich the Student Experience,” “Broaden the Academic Portfolio and Increase Enrollment,” “Expand and Elevate Research Performance and Reputation,” and “Identify Opportunities and Secure Resources from External Constituencies” support this mission and reflect the organization’s awareness of the relationships among educational quality, student learning, and the diverse, complex, global, and technological world in which the university and its students exist.

The 2007/2008 Tactical Plan is the annual guiding document for implementation and accountability for the logical achievement of objectives and goals relative to resource limitations, timing or duration of effort required. Thus, the development of
this academic year's annual Tactical Plan defines how the university will move toward each of the four strategic objectives in the Strategic Plan. The plan designates specific officers, individuals or leaders as responsible for ensuring that a team of university members, faculty, staff, administrators, students, alumni and friends are properly organized and guided toward accomplishing specific actions in support of a goal or objective.

As each goal has a progress or continuous-improvement measurement associated with it, each activity/action item also has a corresponding metric. Periodic progress reports on the Tactical Plan are made and the campus acknowledges and celebrates the activities/action items, goals, and objectives that are achieved. Activities/action items, goals, and objectives not satisfactorily completed or achieved are modified or extended to ensure that they can be achieved and are pursued in the next annual Tactical Plan. As resources become available, the campus adds additional objectives, goals, and associated activities/action items to the next year's tactical plan. Each year the SPSC members construct a Tactical Plan so that the committee can review and update the Strategic Plan's objectives and goals to ensure progress toward the university's vision. The chancellor reports annually to the campus community on the success of the Tactical Plan and the progress made on the strategic objectives. Evidence that each unit of the institution is pursuing the mission reflects the coordinated planning, focus on educational quality, plan implementation and accountability desired in the university's pursuit of continual improvements. Under the previous two chancellors, over a 14-year period, Missouri S&T did not practice a deliberate and comprehensive coordinated strategic planning and budget allocation priority process across campus. Two factors influenced this practice. One is that the academic deans received their budget allocations from the chancellor and provost and exercised nearly complete autonomy in distributing these funds to their departments as the need required. Thus, the focus of planning occurred within the offices of the deans with the departments they had responsibility for.

The second constraint on the university's ability or inability to conduct realistic comprehensive budget planning is state support. From the 2001 to 2007 academic years, the state of Missouri's budget allocation to the university declined steadily from 42 percent to 28 percent. With projected budget reductions every year, the planning to provide resources to meet desired continual improvement objectives and goals campuswide was not as practical as localized planning better achieved within each of the deans' offices.

Relative to the evolution of planning and budget allocation processes, the university devised coping mechanisms involving enrollment management, a voluntary early retirement incentive, new hire limitations, salary freezes, contributive university development outcomes and other cost-saving and cost-avoidance measures that resulted in the university maintaining a relatively stable structure and operations and setting the stage for its present optimistic outlook for planning and plan accountability.

The university's current leadership promotes the linkage of planning and resource allocation based on the University of Missouri's official resource allocation principles, the strategic planning process, and departmental accountability practices.
University of Missouri System Resource Allocation Principles

Following discussions involving the Board of Curators, General Officers of the University of Missouri, the Intercampus Faculty Council, and other senior campus administrators, the university produced a “Resource Allocation Document” in September 2004. This document identifies the principles to be used in annual budgeting and resource allocation. The document’s goal is to provide the tools that will be used to allocate resources to support (a) existing programs that will continue into the future, (b) investment in new activities, and (c) incentives for achieving quality and planned change. Each campus retains all resources, such as tuition and fees, gifts, sales and services, generated through its own activities, as well as resources generated through cost reductions.

The recommendations sent to the Board of Curators regarding the establishment of tuition and fees on the four campuses allow market demand and the differential costs of programs to drive price, thus enhancing the ability of an individual campus to generate additional fee revenue.

Within the shared responsibility among the university, the state government, and the federal government, each campus manages its financial aid relative to its recommended tuition increases and its student demographics in order to maintain financial access and affordability. Resource allocation for base funding factors in the different missions and unique natures of the campuses, assigning funding based on enrollments, programs and levels of students (undergraduates versus graduates and professionals). Resource allocation for base funding will be benchmarked against peer institutions.

To avoid major disruptions in campus operations due to changes in base funding, the allocation of state appropriations in any year includes a “floor” so that no campus’s base will be reduced below existing base funding due to the board’s allocation process. Annual increases to recurring base funding will be made from increases in state appropriations not dedicated to strategic investments and performance-based allocations. Funding for the university’s fiduciary responsibilities (e.g., the Missouri Endowed Chair Program) is prioritized in the allocation process.

Within the parameters of the board-approved campus strategic plan, the campus has the flexibility to make allocation decisions. Each campus determines subsidies and cross-subsidies for its academic programs and other operations. In addition to base funding, the board may make strategic investments and performance-based allocations. Funding for these investments will come from new state dollars and will not exceed 1 percent of recurring state dollars.

Performance-based allocation allows the board to link resources with the priorities in the board-approved strategic plans. The performance-based allocations are one-time, non-recurring “bonuses.” They do not preclude the possibility of a campus receiving a performance-based allocation for high performance in the same area in successive years. Performance measures include graduation rates, student and faculty achievement, quality of academic programs, cost savings, collaboration among campuses, innovation in teaching methods, increase in externally funded (e.g., restricted) research, growth in gifts and development results, and retention rates that are tied to system and campus strategic plans be identified.
The total performance-based portion is added to the total university base in subsequent years for allocation as either part of the base or for investment in new initiatives. Strategic investments may include allocations for specific purposes, unique resource needs, and mission-based initiatives (including funding for systemwide cooperative programs).

Because the University of Missouri is a land grant university, outreach and extension is an integral part of its mission. University Outreach and Extension is funded primarily by county, state and federal appropriations in compliance with Smith-Lever Act regulations and state and federal grants. As federal and state support shrinks, program offerings will need to be adjusted to match county, state and federal resources or other sources of funding will need to be identified.

System administration, which provides unduplicated services in finance, human resources, information technology, government relations and legal counsel, is funded primarily by state appropriations and investment income. The costs for providing services must continue to be controlled and/or reduced to the extent possible without jeopardizing service quality. A budget stabilization fund will be built to mitigate fluctuations in resources provided from investment income. To the extent that other actions or the budget stabilization fund do not cover the shortfall from a decline in state appropriations and investment income, the campuses may need to be assessed to make up the difference.

Implementing Strategic Planning

An important component of the strategic planning and budget coordination process is a formalized process for requesting new funds. This process consists of the following steps:

1. The provost issues a formal “call” for requests for new funds for the next fiscal year in November. Requests for new funding are submitted to the provost in December (units may not submit more than three).
2. The requests, which comply with the Strategic Plan, are evaluated by an eight-person “Panel of Peers.” The panel consists of a panel chair, two department chairs, and two administrative personnel, all selected by the provost, and three faculty members selected by the Faculty Senate. After reviewing the submitted requests, the Panel of Peers creates a shorter list of requests that it considered to be among the highest priorities or greatest needs.
3. The Panel of Peers conducts public meetings in February during which the requestors on the “short list” make presentations regarding their respective requests and panel members ask questions. By March 1, the panel submits its unranked recommendations to the chancellor and provost regarding the requests that are determined to be of the highest priority or greatest need. Inclusion on this list does not guarantee funding. Due to the uncertainty associated with state appropriations for higher education, a “bogey” or estimate of available funds is not established when the “call” for requests is issued. Once the university’s revenues and expenditures for the next fiscal year become clear, the requests recommended by the Panel of Peers are considered by the chancellor for funding.
Missouri S&T Campus Accountability

Academic departments, administrative offices, division offices, and governance councils and committees across the Missouri S&T campus have functions that reflect their role in planning and implementing activities to support the institution’s mission. All academic departments review their mission, strategic plan goals, academic course delivery, decision-making processes, resource development and allocation, and research efforts at intervals ranging from annually to once every five years. Notably, the biological sciences, chemistry, history and political science, mathematics and statistics, and physics departments have conducted voluntary self-studies within the past four years. These departments have committed to self-reporting their goals and improvement outcomes to the UM System academic affairs office. The business administration, all engineering, and computer science departments have professional program accreditation requirements from the Association to Advance Collegiate Schools of Business (AACSB) and Accreditation Board for Engineering and Technology (ABET) respectively, that support the quality maintenance and continual improvement concerns. At present, only three other Missouri S&T departments (English and technical communication; psychology; and arts, languages and philosophy) utilize the traditional five-year review as a formal program accountability mechanism.

Non-academic units on the campus encompass a wide range of responsibilities. These units include Administrative Services, the chancellor’s office, the provost’s office, governing and programming organizations, student affairs, and university advancement, as depicted on the university’s organizational chart. Within each of these units a number of offices are responsible for specifically budgeted, campus mission-related activities that require planning and budget accountability.

Notably, many of these offices, including enrollment management, the provost’s office, student affairs, and undergraduate studies, utilize committees composed of representatives from other components of the campus that support and/or are beneficiaries of their mission objectives to guide and implement strategic planning. This engaged collaboration helps hold them accountable and promotes a well-informed approach to achieving goals and making coordinated budget decisions that more comprehensively contribute to the university’s mission. All of the offices participate in at least annual reviews of their mission targets and objectives.

- **2D WHAT MISSOURI S&T HAS LEARNED**

Adoption of the continued improvement practices required by the Missouri Quality Award and the inclusion of key representation from across the campus in the planning process has benefited the institution’s continuous improvement needs greatly.

- **2D OPPORTUNITIES FOR IMPROVEMENT**

Missouri S&T needs to fully practice accountability for achieving established goals across the university.
SUMMARY OF FINDINGS

STRENGTHS
Acknowledging the role of science and technology and the challenges of globalization in the 21st century drives Missouri S&T’s planning process. A profound challenge for the institution is the diminishing interest among high school students in technological careers, a condition exacerbated by declining state support for higher education. Thus, much of its planning represents an attempt to meet those challenges, from assisting schools implement a pre-engineering curriculum and promoting a greater sense of globalization to making the institution more efficient in its operations while it seeks revenue sources to replace lost public funding and responds to the changing needs of the employers of S&T graduates.

Beyond a campuswide strategic planning committee, the campus has appointed an institutional assessment committee to lead the planning process and to provide leadership in promoting accountability. Academic departments and non-academic units also employ a number of approaches to measuring program effectiveness and how well students are achieving learning outcomes. The campus relies on the University of Missouri resource allocation principles and a tactical plan in its efforts to align budget decisions with its strategic planning documents.

CHALLENGES
Improving the process of evaluating graduate program learning outcomes and improving communication on the progress of the planning process are important areas of concern. Most notably, however, the campus faces the challenge of securing the resources to retain a high quality faculty and improve campus teaching laboratories.

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29 Current Fund Revenue-Actual-From Financial Statements
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3: CRITERION THREE
The organization provides evidence of student learning and teaching effectiveness that demonstrates it is fulfilling its educational mission.
3: CRITERION THREE

> By complying with the requirements of the Accreditation Board for Engineering and Technology (ABET), applying to the Association to Advance Collegiate Schools of Business for accreditation, or participating in the University of Missouri System Comprehensive Program Assessment process, virtually all academic departments at Missouri University of Science and Technology have developed learning goals appropriate to the degrees they award. Assessment of student learning occurs at many levels: in individual courses, in degree programs, and in a variety of assessment instruments administered by several campuswide units.

Drawing upon a highly qualified faculty, Missouri S&T demonstrates a strong and growing commitment to effective teaching which is evident in the hiring and promotion of tenure-track faculty members. The institution has committed substantial resources to improving student retention and enhancing the learning environment on the campus, which includes upgrading buildings and equipment.

**CORE COMPONENT 3A**
The organization’s goals for student learning outcomes are clearly stated for each educational program and make effective assessment possible.

● **3A WHAT MISSOURI S&T DOES BEST**

**Developing Learning Outcomes**
The University of Missouri has long maintained a strong commitment to student learning, a stated priority in both its academic programs review and its long-range planning. In cyclic program reviews\(^1\), departments are expected to include in their summary reports the processes they have developed “to improve student learning.” At the campus level, “an analysis of each program’s strengths” should include “demonstrably high student outcomes assessments in comparison to other institutions.”\(^2\) In the current Strategic Plan\(^3\) of the University of Missouri System, the first of five strategic themes is “Access to Quality Learning and Teaching.” The seventh strategic goal within that theme is to “Assess educational outcomes to improve the quality of student learning.” The first strategic objective in Missouri S&T’s FY2007–FY2011 Strategic Plan\(^4\) is to “Enrich the Student Experience.” Specifically, the campus is committed to promoting “student learning, achievement, teamwork, diversity, leadership, health, and recreation.” Most departments have developed clear learning
goals that are appropriate to the degrees they award. Following ABET guidelines, all engineering degree programs have established clear program objectives, most of which include measurable outcomes.

The University of Missouri System has established a pilot Comprehensive Program Review. This effort prompts academic departments to engage in continuous improvement by asking, “What knowledge, skills, and values should students acquire from their educational experience? How will this experience pay off in employment, societal contributions, and quality of life?”

The review process requires departments to respond to four critical questions:

1. How does the curriculum relate to the program’s learning objectives?
2. What teaching methods are used?
3. What measures are used to assess student learning?
4. How do departmental leaders assure themselves and others that the designs for curricula, teaching and learning methods, and student assessments are being implemented as intended?

Through their participation in this comprehensive program review process several departments, including biological sciences, chemistry, history and political science, mathematics and statistics, and physics, have developed learning outcomes for their programs. The business and information technology department has developed learning outcomes as part of its application to the Association to Advance Collegiate Schools of Business (AACSB) for accreditation. Without the prompt of the Accreditation Board for Engineering and Technology (ABET), AACSB, or Comprehensive Program Assessment (CPA) programs, some departments, nonetheless, have developed clearly indicated learning objectives. Air Force ROTC, for example, has developed clear objectives for each course and lesson by drawing from a national curriculum. The department of athletics focuses on “life skills” such as time management, work ethic, and teamwork as learning outcomes in their program. The Student Design and Experiential Learning Center presents students with open-ended challenges addressing scheduling, funding, and time management skills as well as the technical aspects of several unique design projects. Non-academic units likewise have established learning outcomes, all of which contribute to the broad education of Missouri S&T’s students. Counseling and academic support programs, residential life, student judicial affairs, and student life collectively promote collaborative learning, improved interpersonal and coping skills, a sense of community and acceptance of diversity, appreciation of responsibilities, and understanding of rights.

Assessment of Student Learning

In an effort to determine their capabilities and interests, Missouri S&T students are assessed long before entering freshmen take their first courses on campus. The admissions office seeks to admit students who will most likely be a good academic match for Missouri S&T. Successful applicants must meet selective admissions standards.

If students have an ACT composite score of 24 or higher or the total of their SAT critical reading and math scores is 1090 or higher and they have completed the required curriculum, then they meet the requirements for admission to Missouri S&T.

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<td>1050–1090</td>
<td>48</td>
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<td>22</td>
<td>1010–1040</td>
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<td>86</td>
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<tr>
<td>17</td>
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If their ACT composite score is 17 to 23 or the total of their SAT critical reading and math scores is 800 to 1000, they must meet the high school class rank in Table 4 to be admitted to Missouri S&T.

The Admissions Office has consistently admitted students who have the best chances of success according to high school GPA and ACT scores. Since 2001, about 40 percent of the entering freshman classes have been in the top 10 percent of their high school graduating class, over three-quarters of them have a GPA above 3.50, and their average ACT score has been above 27.20

**Freshmen Assessment Efforts**

The campus employs a variety of assessment instruments to analyze the learning styles and expectations of its freshmen. Each entering freshman class responds to an extensive survey. From this survey, the campus has learned that freshmen believe they are best prepared to study mathematics and science and to use computers, but least prepared to study a foreign language or the fine and performing arts. Most anticipate that they will need to devote only six to 15 hours a week in studying for their coursework. That understanding of the work demands has led freshmen to expect to be engaged in a range of activities beyond the classroom. They anticipate that they will join a student organization (student design teams are particularly attractive), work part time, and interact with faculty members outside the classroom or lab.22

These and other perceptions that students bring to Missouri S&T are reflected in the Cooperative Institution Research Program survey that students take in their freshman year. The 2007 survey revealed that students were confident of their “academic ability” and defined themselves as students with strong mathematical ability who are driven to achieve. Nonetheless, they admitted little confidence in their artistic ability or their public speaking skills. Overall, they expected to be satisfied with Missouri S&T and to maintain at least a B average.23

Since 1998, Missouri S&T has also studied the personality traits of its entering freshmen in an attempt to determine whether any traits predict academic success at Missouri S&T. While confirming that high school GPA and ACT scores are the most reliable predictors of success, a study of the 1998 and 1999 freshman class revealed that “individual differences in personality play a unique, if modest, role in undergraduate academic performance.”
Specifically, the study found that “prudence,” defined as “dependability, diligence, and goal orientation,” at least for Missouri S&T students, is “uniquely related to academic success.” On the other hand, “sociability,” or “low adjustment,” they receive a series of “a disproportionate amount of time and resources to socializing rather than studying … was a negative predictor of grade point average.” The latter finding seemed a bit counter intuitive since many have assumed “sociability” to be a positive trait, one that leads to collaborative learning.23 Drawing upon this study, the enrollment management office and office of undergraduate studies have implemented a program called “Success Chain.” If the study reveals that students have tendencies toward “low prudence,” “high sociability,” or “low adjustment,” they receive a series of informative emails during their first semester dealing with time management, study skills, getting involved on campus, or living with roommates.

To enhance their chances for success in the mathematics curriculum at Missouri S&T, which is critical to the majority of academic programs at the institution, entering freshmen take the Missouri Math Placement Test and a trigonometry placement exam. Faculty members in the mathematics department use those results, along with the students’ high school records and ACT scores, to place students into an appropriate mathematics class during their first semester. During freshman orientation week, students are required to attend either a Problem Solving Workshop, which is used to determine which college algebra course is best for pre-calculus students, or a trigonometry review designed to help students prepare for calculus. In addition to these efforts, the mathematics department offers a “drop-back” college algebra program. College Algebra “is a 3 hour course which is taught every day for the first nine weeks of the semester.” If students earn a C on the final exam they “move on to the Trigonometry course for the remaining six weeks of the semester, while the students who don’t achieve that level of success, are allowed to drop both algebra and trigonometry and to enroll in our five-hour College Algebra (drop-back) class.”24

During their freshman year, students participate in a number of surveys used by Missouri S&T to learn more about their progress in learning and how their expectations change during their initial academic experience. Beginning in fall 2006, the enrollment management office surveyed freshmen to determine how well they were adjusting to collegiate life. The 2007 survey, taken in the middle of the semester, revealed that most freshmen believed they understood what was required to be successful in their classes, knew where to find help on campus, and felt comfortable in seeking help. Nonetheless, about a quarter of those responding felt that they were not meeting their own expectations for academic success.25

Cognizant of the challenges facing first-year students, the campus has sought to improve student learning and freshman retention, primarily through efforts of the office of undergraduate studies and the office of academic support programs. Several of these programs have produced positive results. Hit the Ground Running, a pre-freshman transition program and first-year learning community, introduces new students to “coursework expectations, campus life, and community involvement.” Similarly, Voyager is a year-long residential community for first-year students that provides “a community in which students live together and learn together.” Other learning communities include Achieving a Life of Art, Entrepreneurial Scholars, Experiential Design, Honor’s Academy Living and Learning, Introduction to Research, Seeds of Success, and Women as Global Leaders. The intent of these
programs is to develop collaborative learning and to “develop a connection with the Missouri S&T campus.” The Learning Enhancement Across Disciplines (LEAD) program, which “stresses student-centered learning, mastery of material, student responsibility, and teamwork,” includes nearly 30 centers that focus on courses most first-year students encounter. The centers, which in 2007 involved nearly 50 faculty members, attract about 700 students per week. To assist students in the lower mathematics courses, the campus has also established the **Joint Academic Management Programs.**

The impact of these and other efforts on student learning and retention has been quite positive. Students participating in the various learning communities and the LEAD and JAM programs have consistently achieved higher grade point averages than those who are not involved since the programs' inception in 2001. Most impressive has been the increase in first- to second-year retention rates. In 2002, the retention rate for that freshman cohort was 83 percent. **Five years later, it was nearly 88 percent.**

**Post-Freshman Year Assessment Efforts**

Missouri S&T students who have completed 45 to 75 credit hours take the Measure of Academic and Proficiency and Progress (MAPP) general education test, which replaced the Academic Profile Test (APT) in fall semester of 2006. In the four semesters between fall 2005 and spring 2007, Missouri S&T students scored well above the reference group mean scores, as shown in Table 5.

Missouri S&T students who are enrolled in the secondary teacher certification program consistently outperform their state peers on the College BASE (C-BASE) examination. Students typically take this examination in their sophomore or junior year and the results, along with the APT and MAPP results, provide a helpful indication of the success of the campus’s general education program as it measures the students’ knowledge of English, writing, mathematics, social studies, and science. Table 6 contrasts the percentage of Missouri S&T students passing the CBASE on their first attempt with the state-wide percentages for 2001–2006.

Departments across the campus utilize a variety of techniques to assess learning. At the course level, departments use quizzes, homework, exams, essays, laboratory reports, research papers, design problems, class participation, Power Point presentations, poster presentations, portfolios, student teaching evaluations, peer faculty evaluations, and other measures. The table below provides a snapshot of the assessment efforts:

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<td>State of Missouri</td>
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and grades. At the program level, departments draw from student surveys, student exit interviews, alumni surveys, employer surveys, and consultations with advisory boards or academies. Senior exit examinations, such as the Fundamentals of Engineering Exam, Major Field Tests, and PRAXIS II exam for professional licensure for teacher certification also provide vital information about student success.

Missouri S&T students have performed well on exit exams. Between 2000 and 2007, most students majoring in engineering degree programs have passed the Fundamentals of Engineering, formerly called the Engineer-In-Training test (FE/EIT), but the percentage of those passing has declined from 80.4 percent passing in the 2000–2001 academic year to 55.8 percent in 2006–2007. Those percentages are consistent with a national decline from 82.5 percent to 75.2 percent in the same years. The disparity in the pass rates for Missouri S&T students is largely explained by the institution requiring all its engineering majors to take the test although most other institutions do not. There is no general requirement for engineering students to pass the exam in order to graduate. Missouri S&T requires that all graduating seniors in non-engineering disciplines take the appropriate Major Field Test as a requirement for graduation. The results from 2006 and 2007 reveal that students average scores of above 75 percent on those exit exams. The PRAXIS II exam is a content knowledge instrument “designed to assess whether an examinee has the knowledge and competencies necessary for a beginning teacher…in a secondary school.” Since 2000, all Missouri S&T students taking the PRAXIS II subject exam have passed. The state average ranged from 96–98 percent for those years.

Most departments also provide evidence of student learning assessment in their applications for accreditation or certification. All degree programs have continuously maintained accreditation from the initial date of their award. Table 7 lists the degree programs along with their most recent year of accreditation.

| Missouri Department of Elementary and Secondary Education Certification | Secondary Teacher Education Program | Initial Year of Certification: 1998 | Most Recent Year of Certification: 2005 |
| Committee on Professional Training of the American Chemical Society Approval | Chemistry | Initial Year of Approval: 1940 | Most Recent Year of Approval: 2001 |

Missouri S&T is working to achieve accreditation with the Association for Advancement of Colleges and Schools of Business (AACSB). Missouri S&T’s eligibility application for entering the accreditation process with AACSB was accepted in May 2007. In December 2007, Missouri S&T submitted its accreditation plan to the AACSB’s pre-accreditation committee and received notification of acceptance in January 2008. The plan was transferred to the Initial Accreditation Committee of AACSB, which approved the plan during its March 2008 meeting.
From the date on which the accreditation plan was accepted, Missouri S&T has a maximum of five years to implement the accreditation plan, submit a self study report, and undergo an accreditation review site visit, at which time the university’s ability to meet the AACSB accreditation standards will be determined. The new business and information technology department plans to complete this process in three years. Beginning in 2013, it will submit yearly reports on its progress to AACSB. Once AACSB grants accreditation, all business programs at Missouri S&T will be accredited.

Because of the accreditation and certification requirements of these various agencies, most departments particularly those that must maintain ABET accreditation have had considerable experience in assessing learning outcomes. The 16 ABET-accredited programs on campus completed their most recent self-study reports in summer 2008. The departments involved utilized multiple measures to determine student success in reaching program outcomes: student teaching evaluations, senior self-assessments, graduating senior surveys, alumni surveys, employer surveys, consultation with advisory boards and industry representatives, placement of graduates, and the Fundamentals of Engineering exam. They also utilized outcome/curriculum maps to demonstrate which courses addressed specific learning outcomes, an approach that provided them the opportunity to identity how best to address areas of unacceptable student performance. An example of the approach taken is that of the Mining Engineering Department which “uses a regular mix of oral and written student surveys, employer surveys, alumni surveys, faculty surveys, and development board discussions” to assess student success. The department not only surveys employers of its graduates, alumni, and the faculty, but also surveys graduating students, discusses learning outcomes and assessment measures with its development board, and shares results with “industry, faculty and students for further discussions, and input toward improving the identified areas.” The department then “closes the loop” after identifying strengths and weaknesses in its undergraduate program. Missouri S&T graduates in mining engineering become “technically strong and competent engineers” and have an “excellent work ethic” with “good problem-solving skills.” Nonetheless, employers of Missouri S&T students indicate they “could improve in the following areas: (a) effective presentation and communication skills; (b) economic and business acumen; (c) project management skills; [and] (d) leadership skills.” The department’s response to this feedback included revising four courses in the “mining engineering program … to incorporate technical communication components,” bringing “operating engineers from industry to judge technical and communication components” of “the oral examination of Mining Engineering 393,” introducing a “leadership component” in Mining Engineering 322 with “middle-level managers from industry” presenting lectures to senior majors, the introduction of English 65: Technical Communication “to teach students oral and writing skills in an engineering environment”. The effects of this effort have been positive. As determined by five “industry judges,” students have demonstrated “better written and oral communication skills and better economic content … in the capstone design course.”

Similarly, the computer science department utilizes a number of assessment tools, including a capstone student survey, exit interviews, an alumni survey, data from the Career Opportunities Center, student teaching evaluations, employer
The chemistry department conducts a different type of assessment. In 2002, the department sought “to improve student learning in its general chemistry lecture course.” Specifically, the department wished to offer “a more consistent learning experience in each of the 4 sections of the course” and to “increase the delivered content of the course without a decrease in student learning.” After a pilot effort involving twenty-five students, the department decided to use “student personal response transmitters” (clickers) in General Chemistry in the fall 2004 semester.

The clicker system “consists of infrared transmitters (response cards) that are issued to the students, portable or permanently installed classroom receiver, and presentation software (usually a PowerPoint or other Office software plug-in). The instructor poses a question to the students via PowerPoint and the students respond using the transmitters. The responses are collected and assimilated instantly into graphical data, such as a pie or bar chart, which can be displayed back to the students.” The department has found that the clicker system permits the instructor “to design the content and delivery of their courses to intentionally guide and evaluate students learning” and to “tailor the delivery of the course content instantaneously as prompted by the constant monitoring of student response during the lecture.”

The results from the first full semester of its use were impressive. Many more students received an A when the clickers were used and fewer students using clickers received a grade of C or D. Chemistry department faculty members determined that “the course grade point average (final grades) increased from 2.61 in FS2003 to 2.86” in the following fall semester. The overall student GPA for the course remained at essentially the same level in fall 2005. The department concluded that, “Although introduction of clickers was not the only change introduced to Missouri S&T’s general chemistry teaching, it is still considered to have the single most influential effect. Other changes included the regular assignments of textbook readings with required note taking to prepare for class and the assignment of related homework problems after every lecture.” In a survey of the students who used the system, the instructor learned “the system increased the degree of engagement, learning, and motivation significantly.”

The successful implementation of clickers into General Chemistry quickly attracted interest from all across the campus. By fall 2007, two dozen faculty members have adopted the Personal Response System in about 30 courses involving more than 2,000 students. Employing a continual improvement strategy and taking advantage of what had been learned from the campus’ positive experiences applying clickers, the chemistry department adopted Turning Technologies’ Response Card XR during the Fall semester of 2008 in General Chemistry. This technology allowed more input options, LCD display, data storage and self-pace testing. These clicker features permitted classroom instructors to more deliberately address evaluation/assessment measures, in-classroom active learning, critical thinking, and other innovations that more quantitatively support the educational research practice that is desired in improving the campus’ learning environment.
3A WHAT MISSOURI S&T HAS LEARNED

Faculty members at Missouri S&T are careful to incorporate learning outcomes into their course syllabi to assist students in understanding the expectations for their courses. Departments with degree programs have been fairly consistent in establishing and revising learning outcomes from their programs based upon the assessment of their students’ work. Likewise, the campus has put in place a plethora of instruments to assess student learning at all stages of the undergraduates’ time at Missouri S&T, from their pre-freshman days to their departure. Because most departments have been willing to “close the loop” and revise their learning outcomes based on their assessment of students’ work and because the campus has invested considerable efforts to provide programs to support student success, Missouri S&T retention and graduation rates have improved. There is less evidence, however, of such efforts at the level of graduate programs. Indeed, few of the graduate programs, because engineering programs seek ABET accreditation of their undergraduate programs only, have been conscientious in communicating learning outcomes. An exception is the new MBA program. Moreover, there is little conversation beyond department boundaries about assessment. Few cross-departmental or interdisciplinary efforts have been established to enhance student success.

3A OPPORTUNITIES FOR IMPROVEMENT

The campus is at a critical juncture. In crafting its strategic planning document in 2007, Missouri S&T acknowledged that it needed to “develop an institutional culture of continuous improvement and regularly assess student outcomes.” The campus agreed on very specific “Progress Indicators.”

- Create and implement a campuswide assessment plan (to include the appointment of a campuswide assessment committee)
- Number of departments/units that develop and implement an assessment of the continuous improvement plan
- Number of student learning outcomes assessed annually

This campuswide assessment of learning outcomes needs to recognize that although the departments and their faculty have primary responsibility for academic assessment; Missouri S&T must also draw upon the array of other campus units that can contribute to the effort. Indeed, there needs to be a more comprehensive ongoing conversation about assessment. The new assessment committee can provide a forum for an exchange of ideas and information on best practices in assessment.

Besides such efforts in assessing undergraduate learning, the campus must do a better job of reporting learning assessment in its graduate programs. A few departments are able to demonstrate their graduate student assessment approaches. For example, the materials science and engineering graduate program uses a sequence of assessments of their graduate students. The department’s test procedures for graduate students are designed to ensure a particular skill set and level of preparation for the graduate students from its program. The examination sequence includes three examinations: qualifying examination, comprehensive examination, and thesis/dissertation defense. By having all PhD candidates study for a qualifying examination, the department ensures that its students graduate from its program with a core skill set and the ability to solve problems using fundamental material knowledge, such as
thermodynamic, kinetic, and crystallographic aspects of materials. The comprehensive examination involves the preparation and oral defense of a proposal for research that further develops the communication skills of the student. This examination is a critical component of the professional preparation of the department's graduate students since many will be required to write proposals during their career. Other graduate programs likely employ similar approaches, but have not informed their various constituencies about their assessment methods. A review of the assessment of graduate learning outcomes conducted in Fall 2008 by the vice provost for graduate studies has led to the development of a proposed time-line for implementing a campuswide graduate learning outcomes initiative (see appendix document).

The campus needs to do a better job of measuring students' satisfaction with their learning experiences at Missouri S&T. One helpful start is a survey instrument administered by the alumni association. In a March 2004 survey, graduates from 1971 to 2002 responded to a series of questions. Most helpful were the following questions with the most frequent responses, which included:

- What advice would you give freshmen to get the most from their Missouri S&T experience?
  - "join a fraternity, club, student government, etc. — get involved" (91)
  - "work hard/study hard/develop good study habits" (47)
  - "work hard, play hard" (30)
  - "obtain practical working experience/co-op/intern" (26)

- What course outside your major has been most important to your career and why?
  - "English/report writing" (52)
  - "Interpersonal Communications/speech" (33)
  - "math (statistics/calculus/trig-geometry)" (27)
  - "computer science/FORTRAN and C++" (26)
  - "economics" (26)

- What could have made your academic experience at Rolla even better?
  - "more practical application of concepts" (18)
  - "newer buildings/lab equipment/air conditioning" (9)
  - "better lab work" (8)
  - "more/easier contact with the professors" (6)
  - "more emphasis on non-technical courses (humanities)" (6)

A second helpful step was the distribution of a student satisfaction survey in May 2008. More than 57 percent of students indicated that they were "satisfied" or "very satisfied" with their Missouri S&T experience. This percentage is slightly higher than the average percentage of midwestern four-year public institutions (56 percent). The dissatisfaction percentage is slightly lower than the percentage for Midwestern public universities.
The organization values and supports effective teaching.

**3B WHAT MISSOURI S&T DOES BEST**

As stated in the institution’s Faculty Bylaws, the General Faculty at Missouri S&T is responsible for “academic standards and courses of instruction.” The Curricula Committee, one of the Faculty Senate’s key standing committees, “acts as advisor and coordinator in regard to curricula proposals and all course offerings.” Departments forward course and curricula proposals to this committee, which makes recommendations for action to the entire Faculty Senate. After approving changes in current graduate programs or proposed new programs, the Curricula Committee submits them to the campus Graduate Faculty for approval before the Faculty Senate can take action.

All departments have well-qualified faculty members who determine curricular content for each degree program. Most faculty members have full time, tenure-track appointments. Of the 477 faculty in 2005, over three quarters were full time and virtually all of the full-time tenured or tenure-track faculty members had a PhD (98 percent in 2005). Tenured and tenure-track faculty members are expected to be active researchers who develop national reputations because “productivity in research and other scholarly activities is the most distinguishing characteristic of the faculty of the [four campuses of the] university, setting it apart from all other public institutions in the state.”

Nonetheless, the University of Missouri System sees the “Qualifications for teaching and scholarship” as “very closely related.” Indeed, faculty members at Missouri S&T reflect the university system’s belief that “the faculty member who does not keep current with developing knowledge in the field or who is not constantly searching for new insights cannot be an effective classroom teacher.”

Clearly, Missouri S&T values effective teaching. Through its advertisements for tenure-track positions, the institution demonstrates its concern that new faculty members have a record of effective teaching or a commitment to undergraduate or graduate instruction. For departments, evidence of effective teaching is important not just in hiring new faculty members, but also in making salary recommendations, reviewing third-year faculty members, and making tenure and promotion decisions. Moreover, departments utilize a number of measures to determine teaching effectiveness, including self-assessment statements from faculty members, peer observations, department chairs’ annual evaluations, and mentoring reports. Student evaluations of teaching are conducted at the end of each semester and students’ assessments of the overall effectiveness of their courses have remained high for several years.

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<tr>
<td>Winter 2008</td>
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</table>

(Average Response for all courses on a 4.00 Scale)

[Source: Missouri S&T Student Opinion of Teaching Effectiveness]
The campus recognizes outstanding teachers with a variety of awards. Some departments present awards for teaching excellence. Each fall, the campus Committee for Effective Teaching draws from the results of the previous two semesters’ student teaching evaluations to select approximately 10 percent of the faculty for a campus Outstanding Teaching Award. Since 2004, the campus has honored a select number of faculty members “for their ability to create and maintain an outstanding learning environment for students” with the designation of a Teaching Scholar award, a title which is held for two years. In 1990, the University of Missouri System established an appointment known as the Curators’ Teaching Professorship. Because they are considered “prestigious positions,” each campus may consider “only outstanding teachers with established reputations” as candidates. Missouri S&T selects only one faculty member annually for this appointment. Finally, the University of Missouri System selects one faculty member annually from the four campuses to receive the Presidential Award for Outstanding Teaching, a designation that “recognizes outstanding teaching over a career.” Since its inception in 1991, five of the 17 faculty members who have received this award have been from Missouri S&T.

Missouri S&T and the University of Missouri System provide substantial support for its teaching mission. All new tenure-track faculty members are invited to participate in the Freshman Faculty Program. With a focus on “orienting faculty to Missouri S&T: a learning-intensive university,” the year-long program includes sessions on student learning and effective teaching. The New Faculty Teaching Scholars Program is part of a University of Missouri System initiative designed for faculty in their second, third or fourth year of their tenure-line appointment. In this year-long program, faculty members are introduced to innovative teaching methods through workshops, conferences, retreats, and local monthly forums.

All Missouri S&T faculty members have access to the Center for Educational Research and Teaching Innovation (CERTI). Established in 2003, the center seeks to “foster faculty contribution to the continual improvement of Missouri S&T’s learning environment through programs that emphasize collaborative, experiential, and technology-enhanced teaching and learning strategies.” CERTI hosts many workshops, panel discussions, and lectures on active learning, collaborative learning, and using technology to enhance learning.

Departments provide the most critical support for effective teaching. Some departments provide funding for faculty members to participate in discipline-specific workshops. Professors in mathematics, for example, have participated in an American Mathematical Society workshop on using case studies. Faculty members in the chemical and biological engineering department frequently participate in annual workshops sponsored by the Educational Division of the American Institute of Chemical Engineers and “all untenured faculty attend the week long ASEE (American Society for Engineering Education) Chemical Engineering Division Summer School that is held once every five years.” All instructors in the Air Force ROTC department receive considerable training before they begin teaching classes. Besides participation in an academic instructor school, Air Force ROTC faculty members participate in summer field training and an annual national assistant professor training conference.
In addition to annual reviews by department chairs, most departments appoint a mentor or a mentoring committee to assist new faculty members in improving their teaching. The business administration department, for example, has extended the concept of mentoring to all its faculty members by “establishing a teaching mentoring program where one faculty member with considerable teaching experience and very high teaching evaluations will visit the classes of all other faculty members and provide them feedback to help them improve their teaching.”

**3B WHAT MISSOURI S&T HAS LEARNED**

The Third-Year Review procedure at Missouri S&T has produced a format to better understand the effectiveness of probationary professors in the classroom and in the laboratory. Normally, faculty members submit not only student evaluations of their teaching effectiveness, but also a self-assessment of their approach to teaching along with peer evaluations of their classroom performance and the material selected for use in the course. This dossier is then analyzed by the department chair and the Third-Year Review panel, which includes members of the campus tenure and promotion committee. Faculty members are also beginning to appreciate the value of collaborative and experiential learning for students.

**3B OPPORTUNITIES FOR IMPROVEMENT**

Faculty members could better embrace experiential learning. Participation on student design teams has increased, but more faculty members could participate in the OURE program. Although student participation more than doubled between 2003 and 2006, the 133 participants represented only three percent of the undergraduate population. That is unfortunate, because the program provides a remarkable opportunity for the faculty to illustrate to students the essential links between research, learning and teaching. The campus made an effort to promote greater OURE participation with the establishment in 2007 of an OURE Fellows Program to encourage interdisciplinary research among undergraduate students.

Missouri S&T, like other research universities, needs to demonstrate to its faculty members that effective teaching has the same value to the institution as research achievements. The institution has made some strides in that direction, but the reward structure on the campus nonetheless makes it clear to the faculty that research is of greater significance than teaching.
The organization creates effective learning environments.

Missouri University of Science and Technology has adopted a campuswide strategy to improve both the learning environment and, as a consequence, the learning outcomes of students. Missouri S&T departments are using a combination of traditional and new pedagogical practices in and out of the classroom for delivering course content aimed at academic skill development and measured student learning. To facilitate these efforts, the university established the office of undergraduate and graduate studies in 2001. (As part of the subsequent campus reorganization, this unit was split into the office of undergraduate studies and the office of graduate studies in 2007.) The office of undergraduate studies collaborates with academic departments to improve the learning environment at Missouri S&T through greater student engagement in academic programs and faculty engagement in professional development activities. Additionally, the office of undergraduate studies, along with the Freshman Engineering Program, co-chairs the Missouri S&T Retention Committee in an effort to boost the first-to-second year student retention rate to 90 percent. These goals are reflected in the campus Strategic Plan:

**Goal 1.2**: Expand and increase the quality of the resources, facilities and personnel focused on teaching, learning and the student experience by 2011.

**Goal 1.3**: Engage at least 90 percent of the undergraduate student body in one or more learning experiences beyond those in the traditional classroom setting during their academic career by 2011.

### 3C WHAT MISSOURI S&T DOES BEST

Missouri S&T is committed to providing undergraduate and graduate students with a variety of effective learning environments. Evidence from the National Survey of Student Engagement indicated that Missouri S&T students, particularly seniors, since 2001 have increasingly come to see the campus as having a supportive environment. Seniors in 2006 were also more likely than their counterparts five years earlier to conclude that there was a good deal of student-faculty interaction and that there was an environment of active and collaborative learning at Missouri S&T. Clearly, the campus efforts in these areas are paying dividends.

### The Classroom Learning Environment

Missouri S&T is committed to creating classroom learning environments that foster student learning and support the faculty’s efforts to use the latest pedagogies. Academic departments create effective learning environments by engaging students in hands-on demonstration lectures, out-of-classroom learning activities, tutoring and LEAD sessions, design experiences, team projects, and group learning sessions.  

The information technology department provides and maintains several Technology Learning Spaces (TLSs) across the campus and equips each TLS with “updated machines and equipment, computer workstations that promote collaborative learning and software that supports many scientific and engineering applications.” Classroom learning environment improvements are supported “through continual improvement of facilities, instructional technologies and services. By fall 2007, all centrally scheduled classrooms were equipped with basic technology needed by faculty to enhance instruction and delivery.”
The physical facilities department contributes to effective learning environments by planning, building and maintaining high quality campus environments conducive to teaching, learning and research. The Butler-Carlton Civil Engineering Building recently underwent a major renovation and expansion. Planned renovation, expansion and new construction projects that will enhance the learning environment include:

- Renovation and construction of the mechanical and aerospace engineering building (Toomey Hall, which is currently under construction)
- Renovation of Thomas Jefferson Residence Hall (currently under renovation)
- Construction of the Residential College residence hall (Building I completed in 2005 and Building II completed in 2007)
- Construction of a Freshman Studies Building to include classrooms, laboratories and office space for the Freshman Engineering Program and Student Design and Experiential Learning Center (planned)
- Renovation and construction of a biological sciences/chemistry/chemical engineering building to house chemistry teaching and research laboratories (planned)

The Toomey Hall construction effort is one example of how these projects will enhance learning on the campus. When renovations are completed in 2008, the hall will include a space called the Project Innovation and Creativity Center (PICC). To enhance team projects, it will have hardware and software “to support conferencing, presentation, documentation, and group interaction.”

Laboratory Learning Environments

Academic departments have sought to provide students and researchers with appropriate laboratory environments. Because laboratories are “integral parts” of most science and engineering courses, departments have attempted, through a substantial investment of “time and resources in, and winning grants for, creating the tools which enhance the teaching/learning process,” but with mixed success. In some cases, like in geology and geophysics labs, “hand specimens of rocks, slides, and fossils” are sufficient for students’ needs. “Few universities have” as “high of quality of a testing lab available for the basic mechanics of materials course” as is now in place in interdisciplinary engineering. In biological sciences, however, where the department’s majors take an average of seven laboratory courses, the labs for “both research and teaching, are inadequate” because “the equipment is antiquated.”

Faculty-Student Interactions

Faculty-student engagement is a critical factor in developing a positive learning environment. National Survey of Student Engagement (NSSE) results for 2004 and 2006 indicated that senior students’ score of “student interactions with faculty members” increased from 40.8 to 43.5. Because “it is recognized by educators that faculty-student interaction enhances student satisfaction and learning,” the faculty in the engineering management department has established a series of social events to develop a “student-friendly” atmosphere in the department. Beyond carrying out traditional advising activities, several members of the department serve as faculty advisors for
various student organizations and many work in collaboration with students in research projects. Pizza and ice-cream socials, picnics, dinners at faculty members’ homes, an annual student honor society banquet, and informal “get-togethers” also play a part in that pedagogical strategy. The impact on students of such extraordinary efforts can be substantial. Graduating seniors in the history and political science department concluded that the greatest strength of that unit was the positive learning environment they experienced through small classes, a variety of teaching styles, and the individual attention they received.

Living and Learning Communities
Learning communities within residential settings promote learning outside the classroom. In these communities students experience an environment in which they learn from each other, as well as from programmatic opportunities. These communities are characterized by a high degree of student involvement and peer mentoring. They provide students the opportunity to further develop skills related to their own success while contributing to the learning of others. Missouri S&T living-learning communities include

- the Holistic Learning Community for students who choose a healthy lifestyle
- Residential College Learning Communities, including Achieving a Life of Art, Seeds of Success, Entrepreneurial Scholars, Introduction to Research, Women as Global Leaders and Experiential Design
- the Voyager Learning Community, first-year experience learning community

The office of residential life assesses the value of these communities in a variety of ways, including student satisfaction surveys, average community GPAs, retention rates, and levels of discipline within each community. The assessment data indicates students living within these learning communities generally report higher levels of satisfaction with their college experience, maintain an average GPA slightly higher than that of the campus at large, and experience higher retention rates. As a result of these findings, Missouri S&T has incorporated more learning communities over the last five years and will add two additional learning communities in 2008. As a result of these changes, we anticipate experiencing increased student satisfaction and retention.

Web-Based Learning Environments:
Most faculty members utilize Blackboard, the university’s online course-management system, in a number of ways. They post course materials, provide external links to resources, and provide online help. Faculty members are becoming increasingly more creative in their use of web-based learning tools. For example, Professor Douglas Carroll maintains evening office hours from his home through a “Virtual Learning Environment.”

Library Learning Environment
Wilson Library contributes significantly to the university’s mission to create effective learning environments in several ways. Even though access to the library’s electronic resources has increased substantially in recent years, the library remains the
“preferred on-campus study location.” A 2006 student learning survey revealed that “more than 50 percent of student respondents physically visit the library at least weekly.” Remarkably, “on average, more than 900 faculty, staff, and students physically visit the library on a daily basis.” Clearly, students and faculty alike believe “the physical learning environment created by the library is conducive to study, learning, and personal enrichment.” During their library visits, most students work in groups, study individually, and use the library’s computers. Indeed, “the Technology Learning Space (TLS) in the library is the most heavily used TLS on the Missouri S&T campus”. A wide variety of library resources is also available through the Blackboard interface.

Experiential Learning Environments
Missouri S&T offers various out-of-classroom experiential learning opportunities for its students. Students are engaged in undergraduate research projects, service-learning courses, community service experiences, and student design team projects and competitions. Missouri S&T is committed to engaging a minimum of 90 percent of its undergraduate student body “in one or more learning experiences beyond those in the traditional classroom setting” by 2011 by increasing the:

- number of student participants in undergraduate and graduate research conferences and symposia
- number of courses that provide service learning components
- percentage of students with a global experience
- percentage of undergraduate students with a research experience
- percentage of students with an internship or co-op” experience

Undergraduate Research
First-year students learn about research opportunities through a variety of means, including interaction with faculty in their departments and interaction and involvement with peers who participate in undergraduate research programs. The Opportunities for Undergraduate Research Experiences (OURE) program, administered by the Office of Undergraduate Studies, provides an opportunity for more than 100 undergraduate students to be engaged in research projects with a faculty research advisor in their department. Additionally, the program provides funding to the departments to support the cost of the research projects.

Students participating in the Undergraduate Research Program have an annual opportunity to participate in Missouri S&T’s campuswide Undergraduate Research Conference. This conference serves as an excellent means for students to present the results of their research findings and gain valuable professional experiences and personal growth thorough their experience.

Service Learning
By linking community service to an academic course’s objectives, service learning involves students in “activities that address community needs.” Missouri S&T’s commitment to “promoting student leadership and effective citizenship development is evidenced by inclusion of service learning” in the 2007-2011 campus Strategic Plan. The mission of the “Service Learning Program is to make reflective service learning an integral part of the education and life experiences of Missouri S&T
students.” There is great potential for an expansion of service learning opportunities given the rapidly increasing engagement of faculty in community service activities. Between 2004 and 2007 the number of faculty reporting engagement in community service more than doubled to 99.79

**Student Design**

The Missouri S&T Student Design and Experiential Learning Center (SDELC)80 provides a collaborative out-of-classroom learning environment where students can be involved in design team activities and events. The nine design competition teams are Advanced Aero Vehicle Group, Concrete Canoe Team, Formula SAE Team, Human-Powered Vehicle, Baja Team, Robotics Team, Solar Car Team, Solar House Team, Steel Bridge Team, Human-Powered Speed Challenge, Miners in Space, and Engineers Without Borders. We have learned that student teams “are no longer only possessive of knowledge; they are quick to offer support to their peers or turn to other groups for assistance. This mirrors the collaborative, team-based style of business that is endemic in the global marketplace.”

**Study Abroad**81

Students at Missouri S&T have many opportunities to study abroad82. Missouri S&T has developed agreements with various international partners in Europe, Australia, Africa, Asia and the Americas for student exchanges.

**Cooperative Education**83

The Missouri S&T Cooperative Education Program provides students with an employment opportunity to gain practical degree-related work experience prior to graduation. In co-ops, students work full-time for one or for a combination of semesters. Annually, employers hire more than 100 Missouri S&T students for co-ops. Students may also pursue internships during the summer months.

**Collaborative Learning Environments**

From Hit the Ground Running, Voyager and the various learning communities like Achieving a Life of Art, Entrepreneurial Scholars, Experiential Design, Honor’s Academy Living and Learning, Introduction to Research, Seeds of Success, and Women as Global Leaders, to the Learning Enhancement Across Disciplines and the Joint Academic Management Program, the campus has established a collaborative learning environment that continues to include a growing number of students 84

**Distance Learning Environments**85

Missouri S&T provides opportunities for distance-learning students to pursue master's degrees in civil engineering, computer science, engineering management, geotechnics, information science and technology, manufacturing engineering, mechanical engineering, mining engineering, and systems engineering; graduate certificate programs in 29 disciplines; and non-credit professional development courses in subjects as various as blaster's training seminars and surveyors' review courses. Additionally, the university offers distance learning master's of science programs in civil engineering, computer engineering, electrical engineering, engineering management, information science and technology, manufacturing engineering, and mechanical aerospace engineering at its Engineering Education Center in St. Louis, and
degrees in civil engineering, environmental engineering, engineering management, and geological engineering to Army officers at Fort Leonard Wood. Both the number of courses offered and the number of students enrolled has increased dramatically since 2003. In fall 2007, more than 600 students were taking courses taught largely by regular Missouri S&T faculty members. The tools used to assess student learning are the same as those used on campus, except they are delivered to remote students in an electronic format. 86

**3C WHAT MISSOURI S&T HAS LEARNED**

**Student Retention**

In September 2008, Missouri S&T enrollments had increased in every major except chemistry and female student enrollment increased by 369 students since the fall 2000. The Missouri S&T enrollment management office reported that 60 percent of the enrollment growth since 2005 was due to increased student retention.

Since 2002, Missouri S&T has shown improvement in its first- to second-year retention rate (the measure of those first-time, full-time degree-seeking freshmen who enroll in a given fall semester and re-enroll the following fall), increasing it from 83 percent to 87 percent (achieving the 2000 strategic plan goal). The university’s new goal for first- to second-year retention is 90 percent. Missouri S&T’s six-year graduation rate is currently 61 percent, with a goal of 65 percent by 2011. 87 The six-year graduation rate represents a significant improvement in recent years. In the 1999 NCA report 88, team members expressed concern that the six-year rate for Missouri S&T was only 54 percent. One recent strategy adopted by the campus Retention Committee is to examine why non-returning students made that decision. In fall 2007 the committee reported 89 that two telephone surveys and email follow-ups with “first-time, full-time degree-seeking students” who did not return for their second year to Missouri S&T revealed that, while they were essentially happy with their Missouri S&T experience, these students were going to switch majors, had

![FRESHMEN RETENTION AND GRADUATION RATES](image)
personal issues that could not be addressed while enrolled at S&T, or they needed to leave for financial reasons. The report also revealed that having a more diverse campus, both demographically and in terms of program offerings, would reduce the rate of the departure of some non-returning students.

**The Academic Alert System and Student Academic Success**

To ensure that every student takes full advantage of the educational opportunities and support programs on campus, Missouri S&T implemented the Academic Alert System in 2005. A web-based application that supports communication among instructors, advisors and students, the system is a collaborative effort among the Missouri S&T Retention Committee, information technology, and the office of undergraduate studies. Beyond improving communications among students, instructors, and advisors, the Academic Alert System reduces the time required for students to be informed of their academic status and informs them of actions they need to take in order to meet the academic requirements in their courses.

The Academic Alert System includes a customized reporting function which is available for use by all Missouri S&T departments. These reports provide valuable information about student academic success. Summary reports are regularly provided to the Missouri S&T Retention Committee and to the provost's office. System modifications are made annually. In 2007, the system was modified to help faculty comply with changing academic regulations, to allow for easier use and less-frequent email reminders, and to enhance reporting capabilities for academic departments.

**Students Receiving Academic Alerts**

Utilization of the Academic Alert System is increasing. During the 2006-2007 academic year, faculty members issued a total of 1,417 academic alerts to 1,053 different students on the campus, a 66 percent increase in the number of alerts issued from the previous year.
Alerts Issued

This increase is primarily due to an increased awareness of the resource by Missouri S&T instructors. Instructors in the mathematics and statistics department, followed by physics, chemistry, and computer science departments issue a majority of the alerts. The root causes identified for most alerts issued were lack of attendance and poor performance in the course.

Data obtained from the Academic Alert System indicates that 43 percent of all students who received an academic alert received a final letter grade higher than their reported mid-term grade. Of these students, 66 percent received a 'C' or better as a final grade. While several factors may be involved in the students' improved course grade, receiving an academic alert clearly contributed. The fact that 99 percent of all probationary students at Missouri S&T receive an academic alert indicates that the Academic Alert System is a valuable tool for communicating with probationary students, and students at risk for being placed on probation.

The university established an undergraduate advising office in 2007. This office advises undergraduate undecided and academically deficient students. The undergraduate advising office developed an academic recovery program called "On Track to Academic Success" to assist probationary and academically deficient students on campus. In fall 2007, the undergraduate advising office invited 383 probationary and deficient students to participate in a series of seminars and workshops on self-confidence, self-motivation, self-management, time management, note-taking and study skills, preparing for exams, managing stress and anxiety, and career goals. Forty-seven students participated and 92 percent of them reported being more motivated to improve their academic performance than before taking the "On Track" program. More importantly, 68 percent of participating students raised their GPA.

In addition, the Missouri S&T Retention Committee recently approved a new form, "Notification of Scholastic Probation," designed to better inform and manage students that have been placed on academic probation. This form allows
departments to strongly suggest actions that students should take to improve their academic status. Departments may use this form as a means for encouraging students to participate in the new academic recovery program. Use of this form began in August 2007.

**3C OPPORTUNITIES FOR IMPROVEMENT**

Although departments are assessing their various learning environments and are using the information to make improvements on campus, many departments need to improve documentation of their assessment techniques and findings. The university also needs to ensure that laboratory facilities are upgraded in all disciplines.

Acknowledging that Missouri S&T, a technological research university, does not reflect the diversity present in the state of Missouri, let alone in “the global environment,” the campus has made a commitment to increase the diversity of its student body and faculty. This represents a significant challenge shared by technological universities across the country. “The Executive Summary of a National Analysis of Minorities in Science and Engineering Faculties at Research Universities” by Donna J. Nelson offers a blunt conclusion: “The first national and most comprehensive demographic analysis to date of tenured and tenure-track faculty in the top 100 departments of science and engineering disciplines shows that minorities and women are significantly underrepresented.” Nonetheless, Missouri S&T is committed to increasing female enrollments to 30 percent and minority student enrollments to 13 percent by 2011. The campus has made some encouraging starts in this direction. The recently established Center for Pre-College Programs has established a series of summer programs targeting “under served minorities, gifted students, students in rural areas, and students in inner-city urban settings.” The campus is already seeing some benefits from this series of programs. Nearly a quarter of the fall 2007 freshman class “participated in a Missouri S&T pre-college program.” Also, in 2004, Missouri S&T established the Women’s Leadership Institute, which merged with the long-standing Women in Science and Engineering Program. This program is “focused on the recruitment, retention, educational leadership and professional support of female students” at Missouri S&T. The programs’ efforts to establish new corporate scholarship programs and its creation of a Residential College learning community course titled “Women as Global Leaders” have contributed to increased female enrollment at Missouri S&T and to a remarkably high 93 percent first-year retention rate among female students. Moreover, the campus is committed to increasing the number of female faculty members from 36 to 54 and the number of traditionally underrepresented faculty from 11 to 19 by 2011.

In fall 2006, the chancellor established the Female and Underrepresented Minority Faculty Recruiting and Retention Task Force, giving its members the specific charge of addressing issues and developing strategies “for creating a [Missouri S&T] climate that is more amenable towards recruitment and retention of female and underrepresented minority faculty members.” In its first year, the task force was able to craft a new Faculty Leave Policy and explored the possibility of establishing a day care center. Both Chancellor Carney and Provost Wray joined an ad hoc community committee with representatives from local agencies including the Phelps County Regional Medical Center to seek funding for such a center. The task force
surveyed female faculty members on their perceptions of the work environment at Missouri S&T. Four key suggestions emerged in survey responses: strengthen the role of women on campus, ensure gender equity, provide family-friendly options, and facilitate spousal/partner hiring. The task force has begun to address those issues. A residual result of this effort has been the inclusion of new wording in the campus AA/EOE statement addressing spousal hiring. Beyond indicating that Missouri S&T “does not discriminate based on race, color, religion, sex, sexual orientation, national origin, age, disability, or status as Vietnam-era veteran,” the statement now notes that Missouri S&T “is responsive to the needs of dual-career couples.” The campus also annually conducts a day-long celebration called “Women Advancing Excellence.” Discussions, seminars, and poster sessions highlight the contributions of female faculty members in research, teaching and service. The campus has also allocated $50,000 for the organization of a Women’s Center during the 2008-2009 academic year. Finally, the campus has adopted a multiculturalism and diversity minor that permits students to develop a course of study drawing upon a range of cultures through language, literature, history, psychology, and political science. These represent critical first steps in an effort that must continue and an effort to which the institution’s leadership is committed.

In addition to being mindful of the necessity of having more females in leadership positions in both academic and non-academic units, the campus must also continue its progress in engaging an ever larger percentage of its students in collaborative and experiential learning experiences. In an effort to monitor and measure student engagement, the campus will benchmark the current level of participation in these activities and then conduct faculty surveys and establish student focus groups to recommend potential new experiences that should be offered.

Missouri S&T should continue to refine the Academic Alert System to better assist probationary and deficient students. This effort would improve the learning environment on campus and should improve retention. Building on the successful efforts to improve the retention rate of first-year students, the campus needs now to focus on second-year students’ academic, personal and professional development.
The organization’s learning resources support student learning and effective teaching.

In the past decade Missouri S&T has devoted considerable resources to enhance the learning environment and to improve the quality of teaching. That effort will continue as set forth in the campus Strategic Plan, whose first objective says, Missouri S&T will promote student learning, achievement, teamwork, diversity, leadership, health, and recreation. Missouri S&T will foster a campus culture that embraces its vision by emphasizing cutting edge academic preparation, hands-on experiences (experiential learning), relevant career connections, supportive and engaging communities, and leadership development opportunities.

Core Component 3D

Student Learning Resources
Missouri University of Science and Technology employs an array of resources to improve student learning and to enhance teaching effectiveness.

Faculty and Staff
Missouri S&T faculty members are the most valuable learning resource for our students. They draw from a wide variety of pedagogical techniques to help their students achieve learning outcomes. Some professors, like most in the history and political science department, use the traditional lecture format to introduce new material, but follow up by using “the Socratic method with questions to prompt analytical thought and debate” on key issues identified in the lecture. Other learning experiences include lecture demonstrations in chemistry courses; small group analysis of works of literature in English and technical communications; field courses to the Bahamas, New Mexico, the Grand Canyon, and Michigan’s Upper Peninsula in geology and geophysics; group presentations in public finance; design team projects not only in capstone courses, but also in freshman-level courses like Interdisciplinary Engineering 110; and “after-hours help sessions” in introductory physics courses. Increasingly, faculty members supplement these various approaches with many different types of instructional technology including clickers, Blackboard, smart boards, projectors, and PowerPoint presentations. Faculty members have increasingly collaborated with undergraduate students in research, a move that has linked the university’s research mission with that of student learning. The campus has facilitated this effort by funding the Opportunities for Undergraduate Research Experiences (OURE) program, which seeks to “demonstrate that teaching and research are compatible and mutually reinforcing.” Several departments also fund student research. The psychology department, for example, provides financial support for their undergraduate students to travel to professional meetings and present their research findings.

Faculty members (especially each department’s primary freshman advisors and transfer advisors) in conjunction with staff members (notably in the counseling and academic support office) are critical in contributing to a positive learning environment through their advising efforts. The office of undergraduate studies launched an initiative to enhance academic advising across the campus by maintaining a web
link to advising resources, recognizing outstanding achievement by advisors by selecting seven faculty and staff members to receive awards, and hosting an annual series of talks and workshops on various issues involved in advising. During the 2006–2007 academic year, more than 100 Missouri S&T faculty and staff participated in the academic advising workshop series. Sixty-five percent of these participants were Missouri S&T faculty advisors. In fall 2007, this effort of the office of undergraduate studies effort culminated in the creation of the office of undergraduate advising not only to advise “undecided undergraduates and academically deficient students,” but also to provide “best practice tips and training” in advising to the campus community. The counseling and academic support staff provides a number of vital advising services that students increasingly utilize. Beyond offering study skills workshops and “learning consultations … for students across all disciplines,” the counseling center also assists students with “academic, personal, interpersonal, and family issues” all with the goal of helping students “function more effectively.”

Facilities

Wilson Library is a vital resource for students in all disciplines. With more than 600,000 volumes, 1,200 print journals, dozens of bibliographic databases, and more than 20,000 electronic journals and newspapers, the library enhances student learning, effective teaching, and graduate as well as undergraduate research. There is also an efficient and effective interlibrary loan system and a library instructional classroom with 15 computer workstations, a SmartBoard, projector, and a Multimedia Center that provides assistance with video and graphics editing. Resources not available in the building may be requested from other UM System libraries (through MERLIN) or from 60 other libraries around Missouri (through MOBIUS). Furthermore, reference staff members respond to requests for class-specific instruction. The department of information technology has assumed a prominent role in providing access to resources for student learning primarily through the Technology Learning Spaces, or TLSs, located throughout the campus. The department not only upgrades the equipment continually, but also played a key role, along with the School of Extended Learning and the Center for Educational Research and Teaching Information, in the establishment of a Teaching and Learning Support Center staffed with an educational technology specialist and an instructional design specialist. Beyond offering individual consultation, the center’s site provides “online tutorials and self-help documents on topics such as Blackboard, SmartBoards, Personal Response Systems, and projectors.” The office of residential life has been instrumental in taking facilities for learning to where many of the undergraduate students live. It provides “computer labs in each residential complex, seminar rooms within the residential college, and intensive study floors.” The residential facilities also boast study lounges and each room has an Ethernet connection. In new and renovated housing, wireless service is also available.

Services

In addition to services like the Academic Alert System, LEAD and JAM, a number of other services on campus that contribute to student success. Through the offices of disability support services, student health services, student advocacy, and
student life, the division of student affairs provides services that “complement the academic experience.” By ensuring that academically qualified students with disabilities have access to programs and activities, providing primary health care and promoting healthy lifestyles, assisting students’ quest to find solutions to problems they encounter on campus, and offering “an extensive variety of cultural, educational, social and recreational programs,” the staff in Student Affairs seeks not only to minimize the challenges to student success, but also to broaden the students’ educational experiences.100

Since 1996, the campus has funded a Writing Center110 to help students “write more effectively in any course and at any stage of the writing process.” Besides a library of writing resources, computer carrels, and a SmartBoard and projector, the Writing Center also maintains a staff of tutors to help students work on grammar, punctuation, outlining papers, developing thesis statements, and citing sources.111

Class and Laboratory Equipment and Technology

Several departments have been able to equip their classrooms and laboratories with “state-of-the-art” instructional technology and are able to characterize them as “stellar educational and research” facilities.112 All centrally assigned classrooms have a networked computer and projector and all professors have Blackboard at their disposal. Many use the latter as a key instructional tool. Most faculty members in the electrical and computer engineering department, for example, use Blackboard to post course material and resources. The chemistry department utilizes molecular modeling programs and advanced instrumentation in its laboratories. The geology and geophysics department has a mineral museum with nearly 4,000 specimens and a paleontology laboratory with thousands of “invertebrate fossils, vertebrates, trace fossils and microfossils from all over the world.” In addition, their “remote sensing laboratory has state-of-the-art computing hardware and software for teaching and research.”

The mining engineering department has an on-campus experimental mine which it uses in laboratories for “Mine Rescue, Mine Surveying, Mine Ventilation, Drilling and Blasting, Principles of Explosives, Mine Health and Safety, Underground Mining Methods and Equipment, and Surface Mining Methods.”

The engineering management department has a laboratory facility of more than 5,200 square feet with robots, programmable logic controllers, and “computer numerically controlled equipment” which are used in their Integrated Systems Facility and their Sustainable Design Laboratory.113

Peer Mentors

Peer mentors assist students across the campus. In new student programs, residential life, Student Design and Experiential Learning Center, LEAD, JAM, and Voyager programs, peers are an indispensable resource. For example, LEAD sessions were conducted for more than 50 courses in the fall 2007 semester. While faculty members are involved in the LEAD program, a key component is the contribution from the undergraduate learning assistants who promote a collaborative learning environment114.
3D WHAT MISSOURI S&T HAS LEARNED

In determining how to allocate resources in the future, the campus needs to draw upon the many assessment tools available. From the many exams administered through the campus testing center, alumni surveys, student teaching evaluations, feedback from industry, and exit interviews with graduating students, faculty and staff could more precisely link resources with critical needs. For example, faculty members in the economics department, concerned with their assessments of student outcomes for several semesters, decided to produce their own textbook in microeconomics. Because Missouri S&T students “are mathematically inclined and the typical texts were moving away from this approach,” department members developed a text “more appropriate for Missouri S&T students than others available in the market.”

The campus realizes that the results of the student teaching evaluations are a helpful tool in faculty development if they are used in conjunction with other measures of teaching effectiveness such as self-evaluations, mentoring assessments and peer evaluations.

3D OPPORTUNITIES FOR IMPROVEMENT

While the institution has made progress in providing essential human and material resources to improve the learning environment at Missouri S&T, much remains to be done. The campus needs to increase the number of teaching faculty to keep pace with increasing enrollment.

Wilson Library is limited in its capacity to provide the critical resources for new programs. In the recent past, a substantial number of new degrees, new degree programs, and departments have been added to the Missouri S&T academic portfolio. With a few rare exceptions, no new resources have been provided to the library, diluting existing departmental expenditures across a greater number of programs.

The quality of classroom and laboratory equipment is not uniformly high across the campus. In particular, there is a need to expand the number of computer classrooms, upgrade laboratory equipment in some departments, and to enhance the capability for distance education.

While the campus has begun to devote more time and resources to academic advising, Missouri S&T lacks a mechanism for assessing the quality of that advising. Answers to questions about what measurable impact advising has on our students and the available assessment results can be used to improve advising are needed.

The campus needs to exploit the possibilities that lie within the establishment of a Teaching and Learning Support Center and should continue to support the Accent Reduction Program to improve teaching effectiveness. The recently established “On Track to Academic Success” program, designed to assist probationary and academically deficient students, should be continued.
SUMMARY OF FINDINGS

STRENGTHS

Missouri S&T departments have developed learning goals appropriate to the undergraduate degrees they offer and faculty members in those departments revise those goals based upon assessment of their students’ work. Similarly, the campus, through its assessment of a variety of surveys and tests, has provided an array of programs to support student success. This collective effort has contributed to a marked improvement since 1999 in retention and graduation rates. Missouri S&T has also demonstrated a commitment to effective teaching. From its Freshman Faculty Program and New Faculty Teaching Scholars Program to its process of mentoring and Third-Year Reviews, the campus provides support for the continual development of its teaching faculty. Moreover, evidence of effective teaching is important in the hiring of new faculty members and in making salary, tenure, and promotion decisions. Missouri S&T has committed substantial resources to improving the various learning environments on campus. Beyond upgrading buildings, equipment and library resources, the campus has sought to expand the learning environment in an effort to enhance the chances of student success. The most notable of these developments involve the establishment of several learning communities and an expansion of experiential and service-learning opportunities. Linked with the efforts to better assess student learning, this commitment of resources has produced retention and graduation rates substantially higher than national averages and above the Missouri S&T rates of a decade ago.

CHALLENGES

Notably, the campus must enhance the assessment effort. It must fully implement its strategic objective to “develop an institutional culture of continuous improvement and regularly assess student outcomes.” Missouri S&T should continue to build upon its recent success in experiential and collaborative learning by engaging an increasing proportion of the student body in both types of learning experiences. Missouri S&T must expand its efforts to develop an ever-more diverse campus. A continual upgrading of facilities is vital as is a commitment to improve the quality of advising on campus.
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2008 INSTITUTIONAL SELF STUDY 3: CRITERION THREE

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92 2007 CPCP Report
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104 http://accreditation.mst.edu/evidencecollection/criterion3/Counseling%20&%20Acad%20Supp%20Serv_Criterion3Form.doc
105 http://accreditation.mst.edu/evidencecollection/criterion3/Library_Criterion3Form.doc
106 http://accreditation.mst.edu/evidencecollection/criterion3/IST_criterion3form2.doc
107 http://accreditation.mst.edu/evidencecollection/criterion3/Residentail%20Life_Criterion3Form.doc
4: CRITERION FOUR
The organization promotes a life of learning for its faculty, administration, staff, and students by fostering and supporting inquiry, creativity, practice, and social responsibility in ways consistent with its mission.
4: CRITERION FOUR

Missouri University of Science and Technology values lifelong learning and demonstrates this value through its mission, programs, and its general support of activities that enhance intellectual growth according to the Strategic Plan's value of “Excellence: We embrace academic integrity, exceptional results, and constant improvement in teaching, research, service and economic development activities.” The university’s dedication is seen in the strategic plan objectives “1. Enrich the Student Experience” and “3. Expand and Elevate Research Performance and Reputation”.

The university’s commitment to “fostering and supporting inquiry, creativity, practice, and social responsibility” is reflected in strategic objective one, “Enrich the Student Experience,” and in its programs and numerous, varied co-curricular offerings. These cultivate critical thinking, social responsibility, and cultural awareness, characteristics that comprise the foundation for lifelong learning. Campus intellectual and cultural programming also play an important role in enriching the experience of Missouri S&T students as well as the surrounding community. The university’s commitment is demonstrated in its strategic goals:

1.1 Develop an institutional culture of continuous improvement and regularly assess student outcomes.

1.2 Expand and increase the quality of the resources, facilities and personnel focused on teaching, learning and the student experience by 2011.

1.3 Engage at least 90 percent of the undergraduate student body in one or more learning experiences beyond those in the traditional classroom setting during their academic career by 2011.

Lifelong learning is closely related to research activities. This area has received much attention as the university has increased its research emphasis. The expanded focus on research is reflected in the institution’s strategic objective three, “Expand and Elevate Research Performance and Reputation.” The creative pursuit of new ways to understand and express ideas is viewed as a key part of the educational process at Missouri S&T. The university’s commitment is demonstrated in its strategic goals:

3.1 Expand and increase the resources, facilities, and personnel focused on the research mission of the university by FY 2011.

3.2 Expand and increase interdisciplinary research initiatives of national significance.

3.3 Achieve $55 million in externally sponsored program expenditures which includes research, instruction, and other sponsored activities by FY 2011.

3.4 Increase scholarly performance, productivity, and national reputation.
CORE COMPONENT 4A
The organization demonstrates, through the actions of its board, administrators, students, faculty, and staff, that it values a life of learning.

4A WHAT MISSOURI S&T DOES BEST

Missouri S&T is committed to promoting a life of learning for its students, faculty and staff. This commitment is evident in its curriculum, academic programs, department activities, academic programs review, and long-range planning goals. Despite the vagaries of state funding and the global changes affecting all of higher education, Missouri S&T has a history of achieving its planning goals for the overall continual improvement of the institution and the educated citizens it helps to create. This commitment is further evident in its practices for hiring, promoting and rewarding dedicated faculty and staff and by engaging its students in many learning experiences outside the classroom and rewarding them for their scholarly achievements.

Developing Outstanding Faculty

The UM System, the Missouri S&T Center for Educational Research and Teaching Innovation (CERTI), and academic departments provide numerous faculty development opportunities. The UM System President’s Academic Leadership Development Program gives faculty with administrative responsibilities the opportunity to meet and work with emerging leaders from the other campuses in the University of Missouri System. The program has served 62 faculty members since 2000. This program seeks to assess leadership styles and enhance personal leadership skills. The President’s Academic Leadership Institute (PALI) is an effort to provide leadership development opportunities and ongoing support to administrative staff such as directors, associate directors, and assistant directors on all four campuses. The PALI program has served 12 staff members since 2005.

Missouri S&T supports faculty participation in the New Faculty Scholars Program sponsored by the University of Missouri System. The New Faculty Teaching Scholars initiative is designed for faculty in the second, third or fourth year of their tenure-track appointment. This program exposes the faculty members to a variety of professional growth opportunities, such as the leadership development program as well as workshops on effective teaching methods. For example, all junior faculty who have joined the materials science and engineering department in the past five years have participated in this program. While there is no formal process of assessing this activity, these faculty members have won awards for outstanding teaching and have developed sponsored research programs that are among the largest on campus. The UM System, through its Research Board, also provides grants with a particular emphasis upon “supporting promising new faculty.”

Missouri S&T offers new faculty members a variety of programs and resources in support of their transition into the Missouri S&T community and the achievement of their academic goals during their first few years on campus. Departments encourage new tenure-track faculty members to participate in the Freshman Faculty Forum. This program is for faculty members who began their academic appointment at Mis-
souri S&T during the calendar year of the most recent fall semester. They participate in workshops on grant proposals, effective teaching and distance education.

The office of undergraduate studies offers a series of academic advising development sessions for advisors on campus to build Missouri S&T’s capacity to assist students with achieving their academic objectives. These local conferences provide critical insight into advising best practices and the relationship between advising and student academic success. In 2006–2007 more than 100 participants were engaged in the academic advising conference series (65 percent faculty and 35 percent staff), which included sessions such as “The Academic Alert System,” “Advising 101: The Basics,” and “Advising Students on Probation.”

Missouri S&T departments also encourage faculty participation in professional development opportunities offered by the Missouri S&T Center for Educational Research and Teaching Innovation (CERTI). CERTI demonstrates teaching methodologies that integrate “collaborative, experiential, and technology-enhanced” approaches. Recent examples include workshops on personal response systems (clickers) and active learning. Academic departments also support faculty development by funding faculty participation in education workshops, by encouraging faculty participation in on-campus faculty seminars, and by supporting faculty members who request leave for a semester or a year-long sabbatical for research on teaching-related activities. Such support is facilitated by the University of Missouri System Research Board funding.

Departments also support faculty members who attend research conferences. Many faculty members engage students in these experiences and co-present posters and papers on research conducted with undergraduate students. Departments encourage faculty and student participation in technical professional societies. For example, within the materials science and engineering department, all faculty members and approximately 35 percent of its majors are members of professional societies. The department evaluates “the effectiveness of such participation in meeting the general goals of this component by the number of presentations given by members of the department and by the percentage of faculty members and students that attend such meetings.” At most meetings, Missouri S&T has sent “a higher percentage of our students than other universities.”

Some departments support faculty development by encouraging faculty members to teach and conduct research at other institutions. In recent years, members of the history and political science department faculty have taught at Clemson University, in the Missouri London program at Imperial College, and at the Center for Trans-Atlantic Studies at Teikyo University in Holland. Four faculty members from the geology and geophysics department have taught at the University of Western Cape (UWC) as part of the University of Missouri South African Exchange Program.

These efforts have contributed to a vibrant research community at Missouri S&T. In 2007, 314 regular and non-regular faculty members reported a record number of grants and articles published while maintaining very high levels of books, book chapters, conference presentations, performances, and exhibits.

Student Recognition and Engagement Outside the Classroom

Many undergraduate programs have established learning outcomes related to the university's commitment to life-long learning and employ a variety of methods,
including senior exit surveys and alumni surveys, to assure the effectiveness of their efforts. For example, in 2005 the computer science department determined that 70 percent of its BS alumni felt that their Missouri S&T education provided them with “A solid foundation for lifelong learning and what they expect to do to fulfill these needs as they arise.”

Through many departments on campus, students are engaged in valuable experiential learning opportunities inside and outside the classroom, such as seminars, students’ design, undergraduate research and service learning. Many departments also engage students and faculty in regular seminar programs and professional academy-sponsored lectures series, providing faculty and students continuous learning opportunities. Departments sponsor presentations by visiting scholars.

Missouri S&T students participate in a variety of problem-solving design challenges and competitions. Design team students gain valuable experience from these programs that they take with them after graduating from Missouri S&T. Design team alumni often serve as “volunteer inspectors and contest officials at national and international engineering design events” and they return “to campus to assist teams in design and fabrication.” These exchanges “support life-long learning of both alumni and students, as each group gains from the experiences and design approaches of the other, and reinforces in each group the importance of strong mentoring relationships.”

The campus offers students opportunities to demonstrate their scholarship in a number of ways, including exhibits and open forums, professional conferences, community service projects, local, regional and national competitions, and campus performances.

### Table 9: Faculty Accomplishment System Data 2004–2007

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
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<tbody>
<tr>
<td>Grants</td>
<td>833</td>
<td>1019</td>
<td>1074</td>
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<td>Articles</td>
<td>486</td>
<td>538</td>
<td>548</td>
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<td>Books</td>
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<tr>
<td>Presentations</td>
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<td>1024</td>
<td>1015</td>
<td>1017</td>
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<tr>
<td>Performances</td>
<td>36</td>
<td>50</td>
<td>47</td>
<td>31</td>
</tr>
<tr>
<td>Exhibits</td>
<td>3</td>
<td>3</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

The office of undergraduate studies provides financial support to students and departments through its campuswide Opportunities for Undergraduate Research Experiences (OURE) program. The office of undergraduate studies engages more than 100 students in undergraduate research activities each year. Exit interviews with graduating seniors suggest that more than 60 percent of the undergraduate students in psychology participate in research projects during their years at Missouri S&T.

The campus offers students opportunities to demonstrate their scholarship in a number of ways, including exhibits and open forums, professional conferences, community service projects, local, regional and national competitions, and campus performances. Each year, the office of undergraduate studies sponsors a campuswide Undergraduate Research Conference. This event offers undergraduate students an opportunity to showcase their research efforts for the Missouri S&T campus and the public. In addition to being a professional conference, this event is also a competition. Students compete in nine separate research categories which are judged by the Missouri S&T faculty. Students are recognized for their scholarly achievements at the annual awards ceremony.

Many engineering departments provide funding for students to participate in the Engineers Without Borders experience. Through Engineers Without Borders, Missouri S&T students travel abroad to solve social and technical problems and assist
communities in need. Not only are they able to “better the lives of others,” says Patrick Lancey of Kansas City, Missouri, a sophomore in ceramic engineering, but EWB also “gives us the opportunity to apply what we are learning in the classroom to a real-life situation.”

The materials science and engineering department provides funding for students interested in completing their senior design experience abroad. Students worked on a water purification system in Guatemala in 2007 and made presentations about their experiences to the department at one of the weekly department seminars. The presentation “highlighted some of the learning outcomes that were achieved that were consistent with the objectives of the senior design course. Given the globalization of the world economy and the value of such experiences in professional development,” the department will continue to support opportunities “for students to participate in such activities as part of the senior design course.”

A Capable and Dedicated Staff

Professional development opportunities are available to Missouri S&T staff at the University of Missouri System and campus levels. Besides the UM System Administrative Leadership Development (ALDP) program, the UM System provides educational assistance opportunities for university employees. “The human resource services/affirmative action office, through approved university policies and procedures, encourages staff to utilize educational assistance opportunities by enrolling in University coursework.” The human resource services/affirmative action office also provides “needed and appropriate training for staff, whether on or off campus.”

The Missouri S&T Staff Council provides regular communication between Missouri S&T employees and campus administration. Staff Council meets monthly to discuss and address issues important to the staff such as benefits and professional development. Each year, Staff Council conducts a staff satisfaction survey to help define and assess employee satisfaction with their work environment. The survey results are shared first in a private meeting with the chancellor and then in a forum open to the campus.

Annually, the Missouri S&T chancellor supports Staff Council in hosting an annual Staff Recognition Day on the campus. In addition to supporting an annual Staff Recognition Day luncheon and interactive games, performances and activities for the campus to enjoy, the chancellor honors nine deserving staff members with a Staff Excellence Award.

Missouri S&T departments support staff members’ interest in continual learning by supporting staff attendance at various training sessions, such as Documentum training, PeopleSoft training, ACT Information Manager (AIM) training, ACT Enrollment Information Service (EIS) training, and procurement training.

Staff Council conducted a first-time professional development survey among campus staff in May of 2008. The survey results provided insight into the strong interest of staff in professional development resources relative to technical and communication skills, management and leadership development, and a variety of specific work area professional resource interests. The project has led to collaboration between Staff Council and the human resource services/affirmative action office in planning and providing a professional development program.
Campuswide Activities and Reward System

The University of Missouri System recognizes outstanding faculty members with a variety of awards such as the President’s Award for Outstanding Teaching and the President’s Award for Research and Creativity. Only one faculty member from among the four campuses in the UM System receives these prestigious awards each year. In the 17 years that the teaching award has been given, five Missouri S&T faculty have been selected and in the 28 years the research award has been given, seven Missouri S&T faculty members have been selected. The Missouri S&T campus also recognizes outstanding research and teaching faculty through the designation of Curators’ Professor and Curators’ Teaching Professors. In the past three decades 24 Missouri S&T professors have earned the former designation and the past 17 years 12 have earned the latter designation. The campus also annually selects two Teaching Scholars, faculty members who “create and maintain an outstanding learning environment for students” and selects approximately 10 percent of the teaching faculty for Outstanding Teaching Awards.

Through its alumni association and undergraduate studies offices, Missouri S&T has established annual Outstanding Academic Advising Awards to recognize those who contribute to the continual improvement of our educational environment. The acknowledgement of outstanding academic advising encourages greater support of advising activities on campus, reinforces the importance of advising excellence, and provides incentives and motivation to improve the relationship between Missouri S&T students, faculty and staff.

Cultural events on the campus promote lifelong learning for students, faculty and staff. Several events are offered each year, including the Campus Performing Arts Series, the Campus Free Film Series, the Remmers Special Artist-Lecturer series, a multitude of international cultural events, the Rolla Earth Day Celebration, and others. These events offer members of the campus community the opportunity to learn and grow both professionally and personally.

<table>
<thead>
<tr>
<th>Remmers Special Artist-Lecturer Series Guest Performers/Speakers</th>
<th>Date</th>
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<tbody>
<tr>
<td>Gerald Ford</td>
<td>March 29, 1979</td>
</tr>
<tr>
<td>Leonard Pennario</td>
<td>March 6, 1980</td>
</tr>
<tr>
<td>Dr. Henry Kissinger</td>
<td>March 9, 1981</td>
</tr>
<tr>
<td>Louis Rukeyser</td>
<td>April 13, 1982</td>
</tr>
<tr>
<td>Shlomo Mintz</td>
<td>April 28, 1983</td>
</tr>
<tr>
<td>Thomas J. Peters</td>
<td>June 22, 1984</td>
</tr>
<tr>
<td>Charles Kuralt</td>
<td>October 16, 1984</td>
</tr>
<tr>
<td>Dr. Jeanne Kirkpatrick</td>
<td>September 16, 1985</td>
</tr>
<tr>
<td>Anna Moffo</td>
<td>October 24, 1986</td>
</tr>
<tr>
<td>Admiral John B. Shafeen</td>
<td>February 26, 1987</td>
</tr>
<tr>
<td>Julian Bream</td>
<td>November 11, 1987</td>
</tr>
<tr>
<td>Casper W. Weinberger</td>
<td>May 3, 1988</td>
</tr>
<tr>
<td>Tip O’Neal</td>
<td>October 10, 1988</td>
</tr>
<tr>
<td>Admiral William J. Crow, Jr.</td>
<td>February 1, 1989</td>
</tr>
<tr>
<td>Oscar Arias Sanchez</td>
<td>March 10, 1991</td>
</tr>
<tr>
<td>Dr. C. Everett Koop</td>
<td>January 21, 1993</td>
</tr>
<tr>
<td>Lady Margaret Thatcher</td>
<td>February 7, 1994</td>
</tr>
<tr>
<td>General Colin L. Powell</td>
<td>April 24, 1996</td>
</tr>
<tr>
<td>Sherrill Milnes</td>
<td>January 21–23, 1998</td>
</tr>
<tr>
<td>Senator Bill Bradley</td>
<td>April 4, 1999</td>
</tr>
<tr>
<td>Dr. James Watson</td>
<td>October 4, 1999</td>
</tr>
<tr>
<td>Clarence Page</td>
<td>March 22, 2000</td>
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<tr>
<td>Cokie and Steve Roberts</td>
<td>April 16, 2001</td>
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<td>Denyce Graves</td>
<td>September 13, 2002</td>
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<tr>
<td>Lance Armstrong</td>
<td>November 5, 2003</td>
</tr>
<tr>
<td>Itzhak Perlman with Rohan Denlyu</td>
<td>September 20, 2004</td>
</tr>
<tr>
<td>Wynton Marsalis</td>
<td>March 21, 2005</td>
</tr>
</tbody>
</table>
There has not been a performer/speaker since Wynton Marsalis in March 2005, but the series will resume in October 2008.

The division of university advancement emphasizes professional development and lifelong learning as performance requirements for adeptly communicating the university's attributes to a variety of audiences. Through communications, alumni relations and development, university advancement coordinates with corporations across the state to market the value and availability of lifelong learning opportunities." Missouri S&T Magazine, news releases, the Missouri S&T website, and other vehicles are used to communicate the university's cultural events and academic and research activities to a variety of audiences. Through TechnoFiles and public affairs programming about Missouri S&T, public radio station KMST helps to translate the excitement and relevance of Missouri S&T research in easy-to-understand language to a broad audience.

Missouri S&T: A Technological Research University

Missouri S&T's strong national reputation in science and engineering education is mutually supported by its strength as a technological research university. As emphasized in the introductory section of this document, the technological research university distinction establishes a sound basis for the institution's pursuit to advance the academic strength of our students, student retention and graduation rates, the national reputation of faculty scholars, research expenditures, the number of graduate degrees awarded, and the student-faculty ratio. The strategic commitment of Missouri S&T to continual improvement in all of its processes prompts and promotes the positive evidences of career-long global faculty productivity. Institutionally, Missouri S&T does take advantage of a particularly focused opportunity, given that the majority of its students as technical students, to emphasize the inherent nature of science and engineering careers requiring the inclusion of continuing education as part of every professional development plan. The logic of this focus is borne out by the expectation that approximately 80 percent of our graduates express a desire to participate in graduate study.

4A WHAT MISSOURI S&T HAS LEARNED

Through collaboration with Missouri S&T employers, we have gained valuable insight into the perceived strengths and weaknesses of Missouri S&T graduates. This insight helps the university plan and prioritize resource utilization to better prepare our students for a life of learning beyond the campus. The 2007–08 On-Campus Interview (OCI) Employer Survey conducted by the Career Opportunities Center indicates recruiters feel that "Missouri S&T students are more prepared for the rigors and daily challenges of a technical career than graduates from other institutions."

The Career Opportunities Center also conducts a Pillars of Success Survey with supervisors of Missouri S&T alumni to determine the strengths and weaknesses of our graduates. The results of this survey in 2007–08 inform us that, although Missouri S&T graduates are “prepared, knowledgeable, have strong technical skills and teamwork abilities, they need to improve their written and interpersonal communication skills, time management skills, leadership skills and their involvement in their communities.”
Recruiting and Retaining Personnel is a Top Priority
Missouri S&T has integrated its commitment to meeting its expectations and pursuit of faculty excellence via its strategic planning process. One of its strategic goals is for the institution to become recognized as the employer of choice for faculty and staff by 2011 by creating a campus community that acknowledges, rewards, and celebrates excellence. One indicator that this goal is being achieved is that the organization continues to evolve its practice of clearly communicating expectations for excellence and providing mechanisms that support meeting these expectations.

4A OPPORTUNITIES FOR IMPROVEMENT

Preparing Our Graduates for Life Beyond Missouri S&T
Missouri S&T must continue to provide resources to help students improve their written and interpersonal communication skills, time management skills, and leadership skills. For example, it is critical to maintain the Moeller Writing Center. Working on the assumption “that learning to write is a lifelong process,” the center provides tutoring services to all students on any writing assignment.

Resources for Personnel Development
Although professional development opportunities exist, more can be done to support staff members’ professional development. The university lacks a formal staff professional development program supported by departmental management and a campus-wide personnel review and reward structure.

Increase Experiential Learning
In order to increase student participation, more faculty members need to engage students in experiential learning activities on and off the campus. Missouri S&T has recently implemented a strategic planning goal to achieve this measured increase by 2008-09. As is stated in its Strategic Plan, the campus must continue its progress in engaging an ever-larger percentage of its students in collaborative and experiential learning experiences. More faculty members should be encouraged to engage students in experiential learning both in and out of the classroom. In an effort to monitor and measure student engagement, Missouri S&T plans to define experiential learning for the campus, benchmark the current level of participation, expand current offerings, and develop new opportunities for engagement.

Leadership and Cultural Programs
The mission of the department of leadership and cultural affairs programs is to assist students in developing skills to successfully serve as professional leaders in a global community. The leadership and cultural programs office is responsible for coordinating the student affairs division’s related programs and services. With the Missouri S&T student population preparing to enter a world that expects its leaders to function in an increasingly culturally diverse environment, providing opportunities to develop the ability to be successful in this climate is a critical part of our student’s preparation. The leadership and cultural programs office is responsible for coordinating the provision of the learning opportunities.
Learning about leadership on campus enables students to develop a life skill. Exposure to persons and the activities of different cultures provides students with the chance to become more familiar with the backgrounds of those they will interact with both as a student and, later, in their careers. Successfully providing students with such exposure to leadership and cultural experiences not only requires the presentation of an array of program activities; it also requires them to be developed in a systemic way intended to foster student development. The Leadership and Cultural Programs Office is responsible for coordinating these efforts and for engaging students in order to encourage their participation.

**CORE COMPONENT 4B**

The organization demonstrates that acquisition of a breadth of knowledge and skills and the exercise of intellectual inquiry are integral to its educational programs.

Missouri University of Science and Technology’s primary focus is a commitment to reflect the acquisition, discovery, and application of knowledge manifested through the exercise of intellectual inquiry. This focus is evident in all of the organization’s processes. These processes include enrollment management, the institution’s academic teaching and research practices, its administrative practices, and serving as a valued educational and technical resource for alumni, citizens of the state of Missouri, and an ever-expanding regional, national and international constituency.

● **4B WHAT MISSOURI S&T DOES BEST**

A major theme of Missouri S&T educational practices is the strong focus on the academic success of all of its students. This practice is modeled in the first-year academic experience of its freshman students. Both the foundational learning promoted in the general education program and the intentional integration of experiential learning are a means of building expectations and practice of applying current learning, developing new problem-solving skills, and preparing for professional careers.

**The General Education Curriculum Program: Quality and Impact**

In order to support the June 2000 Missouri CBHE guidelines for transfer of general education credits, Missouri S&T asked a faculty committee to outline a series of university courses to support the guideline’s learning objectives. The general education plan at Missouri S&T consists of a common core of curriculum offerings necessary to equip students for successful and fulfilled lives as educated and active citizens.

The required general education curriculum consists of a broad range of courses that ensures that all baccalaureate-degree-seeking students acquire academic skills and knowledge necessary for understanding, communicating and performing in a diverse and complex world. Students completing courses in the general education plan have the opportunity to acquire the following knowledge and skill abilities:

› To write and speak clearly and effectively through exposure to intensive writing and speech courses. This course set will also assist the student in gaining a greater understanding and enjoyment of aesthetic and creative experiences.
› To locate, organize, evaluate, and synthesize information.
To understand and appreciate ethical choices by reinforcing value concepts and a strong awareness of other cultures and times.

To develop a knowledge and ability to apply fundamental quantitative concepts and their applications by reinforcing mathematical theory and skills. This course set will reinforce a student’s critical and analytical reasoning skills.

To understand common phenomena in the physical and natural environment and understand the methods by which they are studied through reinforcement of high-order thinking.

Courses meeting the above goals concentrate on the development of basic learning skills such as communicating, higher-order thinking, managing information and valuing. Other courses in the general education curriculum meet the remaining goals of knowledge acquisition in the areas of social and behavioral sciences, humanities, mathematics, and the physical sciences.¹⁰

Missouri S&T meets the state-level skill and knowledge areas in its general education curriculum. Students take a combination of a composition and speech courses to fulfill the communication skills area. Students engage in “higher-order thinking” through a communication-intensive course or math or science course. They learn to manage information through courses in math, science, humanities, fine arts and behavioral science. Students examine “moral and ethical values” in philosophy, history and political science courses. Through courses in history and political science, students gain “an understanding of themselves and the world around them” as well as an understanding of the constitutional developments in America. Coursework in the humanities provides insight into the ways “humans have addressed their condition through imaginative work.” A course in mathematics, statistics, or computer science provides an “understanding of fundamental mathematical concepts and their applications.” Students take courses in the life and physical sciences to “cultivate their abilities to apply the empirical methods of scientific inquiry.”

Beyond assigning grades in courses, Missouri S&T utilizes a number of tests to measure student success in reaching the general education learning outcomes. Prior to fall 2006, all students who completed 45–74 credit hours took the Academic Profile Test (APT) which measures college-level reading, writing, critical thinking and mathematics. The campus now utilizes the Measure of Academic Proficiency and Progress test (which is statistically equated to APT) to assess the effectiveness of the general education program. Students in the secondary teacher certification program also take the College BASE (C-BASE) examination, which measures their knowledge of English, writing, mathematics, social studies and science. The Major Field Tests (MFT) is a useful indirect measure of the general education program at Missouri S&T. While the focus of the exam is on the major field of study, the results nonetheless help the degree programs evaluate their curriculum in the context of the general education courses that serve as prerequisites.

**4B WHAT MISSOURI S&T HAS LEARNED**

A comprehensive program of experiential learning has also provided three major categories for student general education on the campus. These learning experiences include student design,²⁸ undergraduate research,³⁰ and service learning.⁴⁰ Each of
these areas provides a dynamic mechanism for faculty-student engagement. The student learning that occurs is characterized by the application of fundamental knowledge applied in a problem-solving manner that subsequently requires students to reflect and evaluate the value of the learning experience. Inherently, these teamwork, leadership development and collaborative problem-solving experiences serve as excellent demonstrations of the institution achieving its mission.

**4B OPPORTUNITIES FOR IMPROVEMENT**

Missouri S&T has compiled considerable data on student success in achieving general education learning outcomes. For example, Missouri S&T students taking the C-BASE exam consistently score above (sometimes well above) their peers in the state of Missouri. However, the campus has not engaged in a comprehensive analysis of the results. Scattered examples to the contrary (such as the mining engineering department), most departments have not assessed how their curriculum is assisting students in meeting general education expectations. This challenge will be a priority of the campus Assessment Committee.

**CORE COMPONENT 4C**

The organization assesses the usefulness of its curricula to students who will live and work in a global, diverse and technological society.

**4C WHAT MISSOURI S&T DOES BEST**

*Missouri S&T is a Technological Research University*

Because Missouri S&T is a premier technological research university, it offers a curriculum that provides students an uncommon opportunity to meet this challenge. Most students major in engineering or the sciences in departments with excellent undergraduate and strong graduate programs. The university boasts 21 research centers and institutes. Campus researchers are awarded more than $37 million in external funding annually. Beyond working with professors engaged in cutting-edge research, undergraduate students are afforded the opportunity to participate in an array of experiential learning experiences that range from design teams to independent learning in the Opportunities for Undergraduate Research Experience (OURE) program. More than 140 students engaged in projects in 2005.

*Students are Placed into Careers in their Chosen Disciplines*

A significant measure of Missouri S&T’s success in preparing its students for work in “a global, diverse, and technological society” is its placement record. More than 95 percent are placed within three months of graduation. While nearly half find positions in Missouri, employers in forty-four states and one foreign nation recruited Missouri S&T graduates in 2006. Moreover, most departments reported that their graduates had salaries above the national averages.
Program Reviews

All Missouri S&T degree programs participate in regular program reviews that measure the currency of their courses and programs. Beyond five-year reviews, all engineering degree programs must also undergo a review when they seek renewal of Accreditation Board for Engineering and Technology accreditation. Several non-engineering programs have participated in the University of Missouri System Comprehensive Program Assessments. A critical part of these processes is an intensive examination of the knowledge and skills the program provides its students and how well this experience contributes to their employment and quality of life.

Missouri S&T Departments Involve External Constituents in Curricular Evaluation

Missouri S&T academic departments solicit the advice of external constituents in a variety of ways to continually evaluate their programs and courses. Most departments have an advisory board, board of advisors, or advisory council with whom they meet at least annually to discuss curricular matters. Some departments also annually send representatives to their discipline’s educational conferences to learn about changes in curricula at other colleges and universities. Departments call upon both alumni and employers of their graduates to respond to surveys regarding the currency of their curricula.

In 2006, engineering management and systems engineering took the extraordinary step of convening a focus-group study. Selected current students, faculty, alumni and employers of their graduates met to refine the department’s educational objectives. During their session, “there was much discussion regarding what industry needs to see in our graduates related to knowledge and understanding of technology, diversity and global awareness.” The conversations led to the development of a new educational objective that the department reports “will help drive our curriculum and content of our courses.”

As exemplified by engineering management and systems engineering, departments heed the advice provided by external constituents about their curricula. Drawing from alumni surveys and exit interviews with graduating seniors, the geology and geophysics department determined that additional courses in meteorology, planetary sciences and remote sensing would be useful to their students. In response, the department has begun to address those recommendations, beginning with the hire of a faculty member with expertise in remote sensing.

Likewise, the mining and nuclear engineering department responded to employer and alumni surveys indicating the need for its students to demonstrate stronger communication, project management and leadership skills. The department responded with revisions in four courses “to incorporate technical communication components” and added English 65, “The Technical Writer in Business and Industry”, to the program requirements. They also added a “leadership component” in the Mining Engineering 322 course with “middle-level managers from industry” presenting lectures to senior majors.

When the business administration department’s advisory board suggested that the business community needed graduates with an understanding of enterprise resource planning (ERP), the department added a required course on the subject and incorporated ERP software into several of its courses.
**Student Design**

A clear strength of the educational experience at Missouri S&T is the opportunities students have to demonstrate subject-area competence in their discipline. Engineering programs have a capstone course, which is typically a student design course where students apply the principles learned in their major’s coursework. For example, students in Computer Science 397, “Software Systems Development I,” work in teams “to develop end-user interviews and concluding with end-user training.” Students are expected to demonstrate “a working knowledge of software design, development, and implementation” as well as their skills in “solving real-world problems.” They must also demonstrate an ability to work “in a team environment,” “meet customer expectations,” and “communicate effectively both in written and oral communication.” In an electrical engineering senior design course, students must submit not only a project report, but also *a document answering questions about ‘real world’ aspects of their design, software and instrumentation tools utilized, written and oral report critiques, and ethics.*

The Student Design and Experiential Learning Center provides dozens of students with the opportunity to experience “hands-on” learning through participation on nine design competition teams. By joining the Advanced Aero Vehicle Group, Concrete Canoe Team, Formula SAE Team, Human-Powered Vehicle Team, Baja Team, Robotics Team, Solar Car Team, Solar House Team, Steel Bridge Team, or Human-Powered Speed Challenge, students can become *equally versed in the concrete and theoretical aspects of their discipline.*

**Co-ops**

The campus has encouraged students to participate in the Cooperative Education Program, a program that involves a semester or more of work in industry. The goal of co-op is to provide “invaluable work experience,” “real world’ knowledge,” and strengthen “communication skills.” Most years, more than 300 students participate in co-ops with more than 100 employers like Anheuser-Busch, Emerson Electric, Monsanto, Harley-Davidson, Boeing, Ameren, Honeywell, Olin, and Deere & Co. in more than 30 states and two foreign nations.

**Student Scholarship**

The Missouri S&T Strategic Plan has set a high expectation for student research and scholarship. By 2011, the campus seeks to have “at least 90 percent of the undergraduate student body in one or more learning experiences beyond those in the traditional classroom setting.” A key component in the efforts to reach that goal is increasing the number of students engaged in original research. Missouri S&T undergraduate students have a solid record of participating in research projects, whether at the Fraunhofer Institute for Laser Technology in Germany, the U.S. Department of Energy’s Pacific National Laboratory in Richland, Washington, or on the Missouri S&T campus. The campus’s Opportunities for Undergraduate Research Experience (OURE) program has increased the number of students involved in research. Besides expanding the “level of research activity on the campus,” the program seeks to provide greater “opportunities for a more active form of learning by students” and to promote greater “interaction of undergraduate students with faculty.”

Beyond submitting a report at the completion of their project, students have an opportunity to
present their findings at an annual campus undergraduate research conference and at an annual undergraduate research day at the state capital. While there was a decline in the number of students engaged in OURE projects in 2007, the number is still up 73 percent overall from 2003.56

Providing Opportunities that Promote Social Responsibility
Missouri S&T is implementing a service learning program in an effort to link “community service experience with academic course objectives.” The program goes beyond volunteerism to an “engagement in a service activity that relates directly to course content.” An initial step included the formation of partnerships with community agencies. This first step was followed by the establishment of service-learning courses following campus guidelines.57 An example of a service-learning course is Engineering 260: ”Layout and Design” in which students prepare brochures, presentations and websites for local non-profit groups and agencies.

This effort follows the lead taken by the campus chapter of Engineers Without Borders, which was established in 2004. Students and faculty members have traveled to Latin American nations to help residents rebuild homes after an earthquake, drill wells, build clean water showers, assess wastewater management needs, and develop improved filtration systems for drinking water. Their goal has been to implement “sustainable engineering projects while developing internationally responsible engineers and engineering students.”58

● 4C WHAT MISSOURI S&T HAS LEARNED

The Need to Build Diversity
Missouri S&T understands the need to become a more diverse campus. In 2008, African-American, Asian-American, Hispanic-American, and Native American students made up about 10 percent of the student body and females made up only 22 percent.59 In the second objective of its Strategic Plan, the campus seeks to increase total enrollment to 6,550 in 2011 “with diversity that reflects the state of Missouri and the global environment in which we compete.” Progress indicators include two critical targets: increasing minority enrollment to 13 percent of total enrollment and increasing female enrollment to 30 percent of the total enrollment.60 Part of the challenge of meeting those goals is the substantial increase in overall enrollment that the campus has experienced. Since 2000, the number of female, Asian-American, African-American, and Hispanic-American students are up substantially; 26 percent, 56 percent, 46 percent, and 136 percent, respectively. However, those gains have been masked by the 27 percent increase since 2000 in the dominant campus demographic group: white, male students.61

For three decades the campus has maintained a Minority Engineering and Science Program that has contributed to an increase in minority enrollment, as well as chapters of the American Indian Science and Engineering Society, the National Society of Black Engineers, and the Society of Hispanic Professional Engineers. In 2004, a Women's Leadership Institute was established.62 Besides these offices and groups, the campus has established an office of student diversity and academic support programs which has a focused mission “to actively recruit and retain academically talented students from ethnic populations that are historically under-represented in higher
education.” Through a series of workshops, guest lectures, a resource center, and opportunities for leadership experiences, student diversity programs seeks to contribute to a learning environment that will encourage “current students to help with recruiting other minority students to the campus.”

**Develop an Entrepreneurial Culture**

Through its new office of technology commercialization and economic development, Missouri S&T seeks to create “a culture of entrepreneurship” on campus. This office represents an effort to link its traditional strength as a technological university with marketplace opportunities for “faculty and student entrepreneurs as well as small and large business.” Through short courses, seminars, and consultation, the center provides assistance in securing startup funds, patent applications, and marketing. To enhance this effort, the University of Missouri Board of Curators has approved a plan for a campus research and technology park to promote economic development as well as “space, access to Missouri S&T researchers and facilities, and business support services that help companies transfer knowledge from the university to the marketplace.” The campus has already begun to reap dividends from this effort. In 2001, the campus received just more than $11,000 in licensing income. Only six years later, in 2007, that figure exceeded $220,000. In the campus strategic plan, the university hopes to realize an annual income of $1.25 million “from entrepreneurial and technology transfer activities by 2011.”

**4C OPPORTUNITIES FOR IMPROVEMENT**

**Consultation with External Constituents**

A number of departments have acknowledged the need to become more systematic in drawing upon the expertise of graduating undergraduates and graduate students, alumni, and employers of their graduates as they review their programs.

**Increase the Number of Students Engaged in International Study**

The office of international affairs is pursuing ways to increase the number of students who participate in international study. While the university provides several study abroad opportunities that enhance students’ exposure to diverse cultures, fewer than 10 students annually enroll in semester-long study abroad programs and approximately 60 more participate in short-term study programs led by Missouri S&T faculty members.

**Faculty Diversity**

Beyond building a more diverse student body, Missouri S&T must improve the diversity of its faculty. The campus has begun to address the diversity situation. Its Strategic Plan includes a commitment to increase the number of female faculty members from 36 to 54 and the number of traditionally underrepresented faculty from 11 to 19 by 2011. Since fall 2006, the campus has maintained an active Female and Underrepresented Minority Faculty Recruiting and Retention Task Force. In its first year, the task force crafted a new Faculty Leave Policy, explored the possibility of establishing a day care center, sought to improve the chances of spousal hires, and surveyed female faculty members on their perceptions of the work environment
at Missouri S&T. These activities have produced positive results, but the university must continue to build a faculty that better resembles the global society that our graduates will face.

CORE COMPONENT 4D
The organization provides support to ensure that faculty, students, and staff acquire, discover, and apply knowledge responsibly.

Missouri S&T expects ethical academic conduct on the part of students, faculty and staff. Indeed, by placing the value statement “Excellence: We embrace academic integrity, exceptional results, and constant improvement in teaching, research, service, and economic development activities” in the Strategic Plan, Missouri S&T reinforces the importance it places on integrity.

4D WHAT MISSOURI S&T DOES BEST
Clearly Defined Policies, Procedures, Training and Compliance Related to Ethics

Academic Integrity
Through faculty surveys, panel discussions, and documents disseminated by the office of undergraduate studies, the campus not only informs faculty members about issues related to student academic dishonesty, but also solicits their advice on how to address the issue. Notably, the office of undergraduate studies provides faculty members with descriptions of campus policies for dealing with issues related to academic dishonesty and encourages inclusions of those policies in course syllabi.

The Missouri S&T Student Academic Regulations Handbook, which is available online, includes a description of the rules and procedures relative to adjudicating student conduct. Beyond written policies and regulations, every orientation program for new undergraduate and graduate students devotes time to discussing the expectation of honest and ethical behavior by students in all academic, as well as personal, matters. Students also are made aware of these expectations of their academic conduct through discussion with faculty advisors and instructors.

Research Integrity
Missouri S&T has clear statements and policies regarding research integrity. A document titled Committing Research to Results: A Guide to Technology Transfer at the University of Missouri states that the university recognizes the growing obligation to convert its research into results for the public good. Missouri S&T feeds a pipeline of scientific and technological innovation for a knowledge-based economy. The university’s role is critical to the future of the institution, state and nation. Missouri S&T seeks the following benefits from its research efforts:

- Public good: Providing for a future workforce, generating new knowledge and putting new knowledge to work to improve the health and well-being of the state of Missouri
- Research mission: Enhancing competitiveness, assets and funding for the benefit of the university
 › Economic development: Leveraging the university’s innovation strengths to enhance the economy, spur job growth and foster an entrepreneurial culture
 › Faculty, staff and students: Fulfilling an obligation for the stewardship of creativity, thereby providing career and financial incentives for employees and enriching the student experience

While some of these goals (such as an entrepreneurial culture) are difficult to measure, the progress of others is more easily tracked. These benchmarks of progress allow Missouri S&T to compare itself to other institutions and parts of the country. Faculty and staff are considered the foundation of the university’s value. All creative work — as captured in grants, publications, and other scholarly endeavors — creates the climate that spawns invention disclosures, patents, copyrightable works, and start-ups, all of which contribute to a vibrant economy.

Missouri S&T measures and tracks progress using the following criteria:
 › Indicators of faculty creativity such as grants, papers, patents, etc.
 › Indicators of research resulting in deal flow such as licenses, options, start-ups, royalty income and recruitments
 › Benchmark indicators compared to peer institutions and national averages on the basis of totals and monetary values, as well as normalized on a per-faculty member and per-research-dollar basis

As a public research institution, Missouri S&T occupies a special place in today’s world, requiring that it be a reliable and transparent source of knowledge and serve as an engine of innovation. Maintaining integrity requires diligence and deliberate action.

**Intellectual Property**

In 2006, the University of Missouri System reorganized and decentralized the office of intellectual property administration, which handled intellectual property operations. Under its initial structure, the office was responsible for the technology transfer activities on all four campuses. As part of the reorganization, each campus established its own office to provide more direct access to faculty inventors and to better suit their individual campus cultures.

The decentralization of technology transfer has led to an improved focus on faculty service and user satisfaction, which, in turn, has led to an increase in the number of invention disclosures received. A number of license agreements have been entered into that might not have occurred under the previous structure. The university’s patent policy is included in the Collected Rules and Regulations. Every invention made by an employee or student of the university engaged in academic work utilizing university facilities must be reported to the campus technology transfer office.

The campus offices have the responsibility and the authority to make decisions and commit resources in pursuit of technology transfer and economic development. The campus offices work directly with faculty and firms and are responsible for all licensing and business development activities on their respective campus. Using the same policies and principles, with guidance provided by the system office, each campus office is customized specifically to the faculty and local culture. The central
office of intellectual property administration supports the individual campus offices through development of standard policies and procedures, maintenance and support of a common technology management database, creation of standard forms and agreements, revenue distribution, and intellectual property protection.75

Missouri S&T’s commitment to research and economic development is designed to facilitate the economy’s robustness and resiliency through better prepared and entrepreneurial students, a structure that develops innovation locally, and a vibrant research enterprise. As the state’s research university serves the state, so, in turn, should greater stature and support for the university be earned from the public, the nation, and the world. The careers of faculty and staff members and the criteria through which promotion and tenure are earned can only be strengthened by a demonstrated commitment to research and economic development.

Missouri S&T faculty are called upon to be creative as they teach classes, write textbooks, monographs, and scholarly papers, develop new concepts, and make discoveries. Regardless of the form, an invention is defined as having two necessary conditions: the completed mental conception of a new idea and reducing the new idea to practice. The university retains ownership of the outcome of its employees’ creativity. However, Missouri S&T is committed to working with the faculty member to protecting individual work and steward any financial return for the benefit of both the university and employee. As in any cooperative relationship, there is a two-way obligation. When the creative work is determined novel and sufficiently commercially viable enough to protect, both the faculty member and the university are called upon to live up to the responsibilities of being public servants in Missouri.76

Managing Conflicts of Interest

As public servants, University of Missouri faculty and staff members carry a special obligation to be aware of situations in which a conflict may arise between private interests and the collective public obligation. Financial conflicts occur when there is a possibility that an employee’s university-related decisions or actions will be influenced by their own financial interest, power, position, authority, or other personal benefits. Conflicts of commitment occur when there is a possibility of an employee’s outside activities interfering with their university’s responsibilities, goals or mission. In fact, such conflicts of interest may arise in the routine activities of being a faculty member. Dealing with these conflicts is best achieved by recognizing, reporting and deliberately managing them.

As an engaged public university, converging interests of faculty and the institution are managed by conflict-of-interest committees on each campus. The committees operate under the following guiding principles:77

› Potential conflicts of interest are inevitable
› Responsibility for disclosure of potential conflicts lies solely with the employee
› There is a presumption in favor of allowing employees to act in dual roles
› There may be instances where it’s best determined the employee does not engage
› Administrators have the responsibility of educating and notifying employees of their obligation to report
ABET Criterion (f): “Professional and Ethical Responsibility”

Most of degree programs at Missouri S&T are accredited by the Accreditation Board for Engineering and Technology (ABET). This accrediting board revised its accreditation criteria, which are designed to assure that graduates of accredited programs are prepared to enter the practice of engineering and satisfy industrial requirements. The general criteria also specify that engineering programs must demonstrate that their graduates possess or satisfy educational outcomes. The Engineering Criteria 2000 were first published in draft form in 1995 and formally adopted by ABET in 1997. Beginning in fall 2001, all engineering programs in the nation were accredited using the Criteria 2000.

One outcome of Criteria 2000 is increased attention in the curriculum to the ethical responsibilities of engineers. One of the Criteria 2000 is an understanding of professional and ethical responsibility. In the engineering management department, for example, more than half of the required courses and a third of all of the courses address professional ethical responsibility. Criteria 2000 includes specifications regarding program outcomes and assessment.

Contractual Compliance

The office of sponsored programs is committed to enhancing and facilitating university research and external funding by providing services, in a timely and professional manner, to all persons involved with sponsored program activities. The office of sponsored programs provides support on financial, administrative, contractual and legal aspects of sponsored program activities. The university’s intellectual property policies can be found in the UM Collected Rules and Regulations, Section 100.20, which are enforced in the research agreements with sponsoring agencies. Details on patentable information are sought when a proposal is submitted and on the project closeout report when required by the funding agency.

Ethical and Responsible Acquisition and Application of Knowledge

Safety

The mission of Missouri S&T’s environmental health and safety department (EHS) is to support the academic and campus community in fulfilling its commitment to teaching, research, and public service. The environmental health and safety department endeavors to facilitate protection of human health and the environment, to ensure compliance with all environmental regulations, to use campus resources wisely, to design programs that are easy to use and non-intrusive, if possible, and to focus on preventative strategies to eliminate potential risks.

The safety and risk management program provides guidelines that apply to all students, faculty, staff, and the general public. The program is an integrated part of the organization and an important part of the function of each academic department and every non-academic office. Missouri S&T’s environmental health and safety department has personnel available to assist all units on campus with safety-related matters.
ISO 14001 and Environmental Management System

The International Organization for Standardization (ISO) is a worldwide federation of national standards bodies (ISO member bodies). Organizations of all kinds are increasingly concerned with achieving and demonstrating sound environmental performance by controlling the impacts of their activities, products and services on the environment in a manner consistent with their environmental objectives and targets. Implementing programs using ISO guidelines help organizations recognize areas for improvement which in turn fosters a proactive approach regarding environmental activities and impacts.

After many months of hard work, Missouri S&T received its ISO 14001 certification on June 29, 2001. Currently, there are more than 4,000 colleges and universities in the United States. Missouri S&T was the first and continues to be only higher education institution in the nation to be ISO 14001:2004 certified. By utilizing the guidelines in the ISO 14001:2004 Standard, Missouri S&T can effectively monitor its daily operations to ensure protection of the environment.

An environmental management system (EMS) is a mechanism for managing the environmental impacts of an organization’s activities. The implementation of an EMS is essentially a voluntary initiative. An EMS provides a structured approach to the planning and implementation of environment protection procedures using the guidelines set forth under the ISO 14001:2004 Standard. It incorporates a management into daily operations that include long-term planning and other quality management systems. The Missouri S&T EMS is a powerful tool for improving environmental performance and enhancing efficiency. The EMS is not prescriptive. Rather, it requires the campus to take an active role in examining practices and determining how impacts should best be managed. This approach encourages creative and relevant solutions from within the organization itself. The Missouri S&T EMS program also ensures performance meets regulatory requirements and keeps the campus aware of more stringent regulations which might be introduced in the future.

Safety Training Program

Before Missouri S&T employees are expected to work safely, they are given training in the safest way of doing their job. Training programs are designed to teach safe job performance and increase the all employees’ safety awareness. All supervisors have the responsibility of making sure that employees have been instructed in the proper procedures of handling demanding physical and hazardous duties assigned to them.

Chemical Safety

Missouri S&T is committed to providing a safe learning and working environment for our students and employees. As part of this commitment, the campus developed a chemical hygiene plan in 2000 to establish a standard format for chemical safety in the laboratories of the university. This plan follows Occupational Safety and Health Administration (OSHA) Laboratory Safety Standard (29 Code of Federal Regulations 1910.1450). The standard was developed to ensure that laboratory employees are informed about the hazards associated with the chemicals used in their work area and that appropriate work practices and procedures are in place to use these chemicals in a safe and informed manner based on the known hazards for the chemicals. This plan ensures personnel are trained and can recognize and comply with
workplace safety requirements. The implementation of this plan and development of lab-specific procedures results in a safer work and learning environment for employees and students.

**Radiation Safety**

Missouri S&T has created a Handbook of Radiological Operations as the official guide in all matters relating to radiation protection and control of radioactive materials at the university. It has been prepared by the UM Radiation Safety Office with input from the Missouri S&T Radiation Safety Committee (RSC), which serves as the advisory body to the chancellor and faculty and staff members of the Missouri S&T campus for matters related to radiation protection and control. The RSC is appointed by the chancellor, and is responsible for establishing policy and guidelines to safeguard personnel, property, and the community-at-large from exposure to hazardous radiations.

Missouri S&T applied for and was granted by the NRC a Type A, broad-coverage license for possession and use of a variety of by-product materials. In granting this license, the NRC expects the university to obey all pertinent rules and regulations to ensure that the Radiation Program is conducted in a safe manner. It is the objective of this handbook to make all users familiar with their duties and responsibilities. Therefore, it is incumbent upon each person authorized to use a radiation source (covered by this license) to become familiar with and to observe the rules and regulations contained herein. Copies of the license and of the documents related to it are maintained by the Health Physics Office.

**4D WHAT MISSOURI S&T HAS LEARNED**

Missouri S&T has gained significant insight through its programs and practices related to knowledge acquisition, discovery and application. Driven by its strategic goals to enhance the institution’s research mission and grow the experiential learning experiences of its students, Missouri S&T has learned that improved awareness of policies associated with research contracts and a commitment to show accountability that promotes continual improvement are hallmarks for demonstrating and sustaining responsible acquisition and application of knowledge. This awareness has prompted the university to conduct staff support awareness seminars that emphasize strengthened foundational adherence to contract audit policies. Additionally, there is a foundational recognition that science and engineering students involved in experiential learning projects require formalized safety and project management training. In addition to the current chemical safety program, implementing a design safety program has become a campus priority.

**4D OPPORTUNITIES FOR IMPROVEMENT**

**Integration into the Curriculum**

Missouri S&T takes seriously its responsibility to maintain ethical standards for the creation of knowledge and for working with students to instill responsible attitudes and behaviors in their handling of knowledge. Much of the training in all areas of ethical behavior in academic work falls to faculty instructors in capstone and other designated courses and faculty members who serve as research mentors. The self-
study collected evidence of this training from the department of chemical and biological engineering, chemistry, computer science, engineering management and systems engineering, and Curtis Laws Wilson Library. These examples are excellent, but the university could work to expand this type of training to all departments, increase cohesiveness, and increase faculty leadership.

**SUMMARY OF FINDINGS**

**STRENGTHS**

Missouri S&T has a significant position of strength relative to its processes and practices supportive of meeting its strategic plan goals related to the acquisition, discovery and application of knowledge. The institution’s focus on science and engineering education demands that it integrate and promote the culture of lifelong learning that is inherently required by the ever-changing and continually improving nature of technology. Thus, the institution’s “top research university” status, associated experiential learning structure in its educational programs, and promotion of its mission to integrate education and research to create and convey knowledge to solve problems for our state and the technological world illustrate the institution’s major strength.

**CHALLENGES**

The most apparent challenges for Missouri S&T involve the ability of the institution to maintain enough funding and other resources to balance its continual improvement goals. The demands of meeting public, technological education needs through improved physical facilities, technological education tools, and the most competent staff and faculty members are indeed key challenge.
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80 http://www.umsystem.edu/ums/departments/gc/rules/
As called for by its mission, the organization identifies its constituencies and serves them in ways both valuable.
5: CRITERION FIVE

> Missouri S&T serves many constituencies, including its internal community, area K-12 schools, and universities in the state and overseas, professionals seeking further education or training, municipal governments, industries, nearby Fort Leonard Wood, and the local community, all of which utilize campus services and facilities. The high value that these constituencies place on those campus services is partly due to Missouri S&T’s efforts to continuously assess the effectiveness of its interactions with those constituencies.

CORE COMPONENT 5A

The organization learns from the constituencies it serves and analyzes its capacity to serve their needs and expectations.

Missouri S&T continually assesses the needs of its internal and external constituents, through campus surveys and forums, the Board of Trustees, the Corporate Development Council, departmental academies, and advisory boards. Always cognizant of the financial challenges involved, the campus nonetheless continues to provide services to a growing number of constituents.

5A WHAT MISSOURI S&T DOES BEST

Missouri S&T regularly assesses the changing needs of its constituencies. Departments that include enrollment management, undergraduate studies, graduate studies, academic affairs, and institutional research and assessment conduct regular assessments and surveys aimed at evaluating the impact of their programs and services to students, staff and faculty within the campus community. Academic departments and programs on the Missouri S&T campus consult with external advisory groups and draw upon their recommendations as well as surveys, evaluations, and interviews to review and improve current processes, programs, and campus plans. The Board of Trustees, the Corporate Development Council, and the departmental advisory boards, whose members include alumni and corporate leaders, are some of the leading consulting bodies Missouri S&T draws upon to better understand the needs of its external constituents.

The Missouri S&T Board of Trustees provides counsel and advice to the chancellor about enhancing the stature of the university, promotes the participation of alumni and friends in building and advancing the public image of Missouri S&T, and helps identify and secure financial support for the university. The Corporate...
Development Council includes the top employers of Missouri S&T graduates, Missouri S&T’s major corporate supporters, and Missouri S&T entrepreneurs. They have been appointed by the chancellor to represent their companies in a council that meets on the Missouri S&T campus twice a year. Some academic departments also consult with members of the Corporate Development Council to find ways to improve programs and services.

Members of academic department advisory boards and academies include alumni, former faculty, and friends who have achieved recognition in their productive careers. Ten campus departments have academies and each one provides guidance and counsel to strengthen student dedication and understanding of career choices by personal and professional example and assists programs in identifying, securing and providing financial and resource support.

The Academy of Mechanical and Aerospace Engineers (AMAE), for example, has developed a strategic plan to complement the current campus plan. The primary goal of the AMAE strategic planning committee is to assist the mechanical and aerospace engineering department in identifying strategic, business, and academic goals and to provide recommendations to the entire academy board regarding how the academy can position itself as a resource to support the department’s strategic vision. The engineering management and systems engineering department likewise meets with its Academy of Distinguished Alumni every semester. Additionally, a number of faculty and students recently met with academy members to engage in focus group discussions about the goals and purposes of the engineering management program. In response to feedback collected in focus group meetings, the engineering management and systems engineering department is currently considering adding a required course in project management to the curriculum.

The use of industry representatives such as those in the business and information technology (BIT) advisory board, coupled with the ongoing interaction and communication with employers and recruiters of IST graduates provides the strongest evidence that the services the information science and technology department provides are valued. The strength of placement rate and interest from prospective employers demonstrates the relevance of departmental choices and programs. In spring 2007, the board provided input about the core IST curriculum, notably their courses on Information Systems, Algorithms and Programming, and Introduction to Data Structures and Applications. The faculty revised the courses and presented the changes to the board in fall 2007. After board approval, the department implemented the revisions in spring 2008.

Besides collecting data from each graduating senior through an exit interview, the computer science department asked its alumni to complete a survey to measure program satisfaction. At least 70 percent of the BS alumni surveyed, who are working in the computer industry, felt that their Missouri S&T degree provided them with a strong technical background in computer science, the ability to work effectively in a team environment, the ability to communicate effectively, a solid foundation for lifelong learning, an understanding of the ethical and societal concerns associated with the computing profession, and professional preparation that enables them to compete effectively in today’s changing world.

Centers also are important in assessing constituent needs. The Regional Professional Development Center (RPDC), which is housed on the campus and is funded
2008 INSTITUTIONAL SELF STUDY 5: CRITERION FIVE

by Missouri S&T and the Missouri Department of Elementary and Secondary Education, has an advisory board that meets several times each year to get feedback from school districts to determine what their teachers and administrators need regarding professional development. The RPDC also schedules meetings with professional development chairs in different parts of the region to ensure that participation is easier for the school representatives. Drawing upon these sources of information, the RPDC develops workshops that address topics as various as working with autistic children and dealing with difficult parents.

Besides its advisory board, the Career Opportunities Center frequently asks external constituents to evaluate the COC services. For example, 91 companies at the fall 2007 Career Fair responded to a survey, one in which 92 percent said Missouri S&T was a key school in their recruitment, and 98 percent said Missouri S&T students were well prepared. Also, after each on-campus employer interview with students, the COC asks them to complete a survey assessing how well the students are prepared. Besides strong technical skills, the employers would like students to have five additional traits: “communication skills, teamwork, leadership, professionalism, and business acumen.” In response to these results, the student affairs division has developed an office of leadership and cultural affairs to develop programming to address these expectations of employers.

5A WHAT MISSOURI S&T HAS LEARNED

Missouri S&T provides a variety of services that address the needs of its constituencies. Based on assessment of how well these services meet the needs of its constituents, it is clear that the university provides a good focus to support its mission. It is also clear that changing circumstances related to factors that affect the operation of the institution demand that the university continually improve its operational process. A major lesson learned that is applicable to many of the programs and processes that have emerged as a result of the institutional name change, its restructuring, and strategic planning is the adoption of a “plan-do-check-act” process to assist in judging how well the institution is meeting its objectives and goals. This relatively quantitative approach has added to the definitiveness of strategic actions taken as part of the evaluation process applied to specific institutional improvements being sought across the university.

5A OPPORTUNITIES FOR IMPROVEMENT

While many programs on campus utilize rigorous assessments and use that data to improve programs and facilities, a need remains for a better overall assessment of campus efforts to meet the needs of external constituents. Despite a strong institutional intent to engage constituents and to use the information gathered from these interactions, there is little of the systematic information gathering essential to a comprehensive assessment of the effectiveness of various outreach efforts. Specifically, there is scant evidence of comparing Missouri S&T’s levels of client engagement with documented benchmarks. Also, there is little documentation of constituent expectations regarding their desired level of engagement with Missouri S&T.

In light of these observations, the university is addressing improvement opportunities by establishing a campuswide assessment committee that will monitor and
measure constituent service. In addition, the university has initiated new programs aimed at enhancing constituent alumni participation with the specific focus to prepare students for real-world professional roles.

CORE COMPONENT 5B
The organization has the capacity and the commitment to engage with its identified constituencies and communities.

Missouri S&T serves a broad constituency base and engages itself within multiple community environments. Service expectations for various entities can be traced to Missouri S&T’s historical mission as a land-grant institution providing service, education, and outreach to the community. This expectation continues to be evident in Missouri S&T’s evolution and subsequent strategic plans. As a higher education institution, Missouri S&T is by nature a service provider. This reality is evident in its physical ability to provide programs as well as in the expertise of its faculty and its staff. These various engagements have resulted in Missouri S&T having an extensive and varied list of clients. Maintaining the capacity to engage itself with all of its potential client groups is essential to Missouri S&T’s ability to sustain relationships, but doing so has required significant increases in resource investments and requires the use of varied means of engagement. Further, the question of engagement not only requires an investigation into the institution’s capacities and its commitments, but also into the effectiveness of these ventures. Identifying adequate resources to allow Missouri S&T to engage with its clients is a continuing challenge.

5B WHAT MISSOURI S&T DOES BEST
Missouri S&T’s planning processes project an ongoing engagement with and service to a growing number of external constituents. Missouri S&T has embraced an ambitious mission, one that broadly identifies many external constituencies, “to integrate exceptional education and research to solve problems of our state and the technological world.” The fourth objective of its Strategic Plan makes it clear that the campus understands the necessity of developing mutually beneficial relationships with external constituents to achieve that mission: “Missouri S&T will create opportunities and acquire resources from external constituencies by creating entrepreneurial opportunities and by engaging alumni, corporations, foundations, partners, and friends in the life of the institution.” While the campus acknowledges that these relationships are critical in enhancing the financial stability of the institution, implicit in this objective is the commitment to provide these and other constituencies with valuable services.

Missouri S&T’s external constituents include corporate and professional leaders, employers of S&T graduates, companies needing services, licensed professionals, entrepreneurs, public and private “entities,” distance education students, K-12 school districts, international universities, graduate schools, patrons of the performing arts, social agencies, athletic fans, and the library’s public patrons.

Some of the most meaningful engagements with these external constituents are those that involve S&T students. Many students participate in co-op and internship programs in industry and the professions. In 2005–2006, for example, 131 employers in 32 states created 404 cooperative education (co-op) job opportunities for students. The campus will initiate a new program in the 2008–2009 academic year called the “Leadership Development Externship Program.” Designed as a “volunteer
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industrial partner-student ‘shadowing’ opportunity for students to spend from one to five days during the spring break actively learning industrial leadership practices,” the externship program is intended to help students “refine their career goals while allowing the sponsor to examine the interests, skills and competencies of participating students as potential employees or interns.”

Missouri S&T is active in the community it serves. The office of volunteerism and service provides students with interactive volunteer experiences that provide participants an opportunity to gain cultural and social awareness of issues by connecting them with a variety of community service projects. Students participated in “Volunteer Storm Clean-Up” following the 2007 ice storm. Seventy-five students from Missouri S&T assisted the City of Rolla and the Phelps County Community Partnerships with picking up tree limbs and debris. Students assisted elderly residents who were not able to carry fallen branches to the curbside for pick up.

Other organizations served by Missouri S&T student volunteers include public schools, the Russell House (a local non-profit organization that provides services to victims of family violence), Kidcare America Center of Rolla, the Hospice Volunteer program, and the “Mentoring Makes a Difference” program sponsored by Prevention Consultants of Missouri. Service organizations on the Missouri S&T campus include Alpha Phi Omega, Circle K, Gamma Alpha Delta, Habitat for Humanity, Intercollegiate Knights, Lambda Sigma Pi, Omega Sigma, and “Up ‘til Dawn.”

Student Council works with the department of student life to sponsor a yearly awards banquet that recognizes the contributions that individual students and organizations make to the community. The Corporate Development Council hosts the awards banquet. The “Group Community Service Award” is given to a student group that demonstrates a high dedication to the services of the community at large based on the amount of quality of the service provided as well as its betterment of the university’s standing in the community. This award is for groups whose stated purpose is other than community service. The “Individual Community Service Award” is given to a student who has pursued community services to its utmost limits. The department of student life tracks all community service hours provided through student organizations. This data is reported to various national organizations such as fraternities, sororities and national service groups.

* 5B WHAT MISSOURI S&T HAS LEARNED

Missouri S&T has made an increased commitment to engage with its identified constituencies and communities, and utilizes its resources well in providing a wide range of valued services. The university must maintain a beneficial relationship with its constituents in ways while being mindful of the availability of applicable resources, including budget resources that must reflect a balanced approach.

* 5B OPPORTUNITIES FOR IMPROVEMENT

Missouri S&T effectively manages its resources but budget challenges affect the institution’s ability to maintain and improve current service levels. Additional resources, both financial and human, are needed. If funding remains at current levels, Missouri S&T will need to focus on the areas of greatest priority and eliminate others. Additionally, with the growing need to engage external clients as a source of
resource support, the allocation and effective use of existing resources for this purpose will grow in significance. The needs are many, notably for the university’s most valuable internal constituents its students with some of the most pressing being improvement of recreational facilities, cultural facilities, and additional academic classroom space.

**CORE COMPONENT 5C**

The organization demonstrates its responsiveness to those constituencies that depend upon it for service.

Missouri S&T demonstrates its responsiveness to constituent needs in the many collaborative ventures that it undertakes with a wide variety of partners. These partnerships provide for efficient and effective communication between Missouri S&T and its partners to create working arrangements that meet the educational and economic goals of all concerned. These working arrangements encompass international student academic resource needs, research and technical development aimed at critical problem-solving across a wide spectrum of technical areas, and the real-world related preparation of students for professional careers.

**5C WHAT MISSOURI S&T DOES BEST**

Besides responding to the various needs of internal constituencies, Missouri S&T has been responsive to a number of external ones. The campus is aware of the need to address the concerns, for example, of the growing international student population on campus. The office of international affairs\(^1\) has developed campus and community programs that contribute to improving the learning environment and learning outcomes of international students, the campus and the community. Many of the programs emerged in response to requests by students. For example, the International Student Advisory Council was developed in response to a request by international student leaders who wanted a public forum to express their concerns and gain immigration advice from international student advisors. This group meets monthly to address concerns from the international student body. Representatives from all international student organizations are invited to serve on this council. Activities developed by this council include International Education Week and improvements in international student orientation with assistance provided to newly arriving students by international student organizations. Evaluations are conducted on a regular basis to develop programs that will be of interest and educational value to each audience. Students take a leadership role in determining activities and educational goals for international campus activities. Public forums provide opportunities for the office to share critical immigration updates, an issue that has gained increased importance in the past few years. The office of international affairs is responsible for meeting all requirements imposed by the Student and Exchange Visitor Information System (SEVIS)\(^2\) system, a federally-mandated student immigration reporting database.

The campus is also cognizant of its responsibility as a research institution to work closely with federal, state, private and non-U.S. government entities. As the sponsored research activity has increased, so has the range of external constituents relying upon Missouri S&T researchers. The Cloud and Aerosol Science Laboratory\(^3\) illustrates this responsibility well. The lab works closely with the National Aeronautics
and Space Administration, the Federal Aviation Administration, the Department of Defense, the Environmental Protection Agency, Pratt & Whitney, General Electric, Boeing, Rolls Royce, a number of American commercial airlines and airports, the United Kingdom Ministry of Defense, DLR-Germany, Shell Oil, and KLM airlines. Contracts are specific to each entity’s needs and expectations with respect to emissions from aircraft engines. More broadly, the office of sponsored programs must be responsive to both the internal and external constituencies because of the timelines and requirements set by solicitations and contracts. Failure to meet stated timelines and requirements would disqualify the university from funding opportunities. The office of sponsored programs routinely communicates with both internal and external constituencies via email regarding all aspects of a proposal from submission to closeout. See Table 11 for proposed dollar summaries.

Cooperative Programs
Missouri S&T has developed two cooperative education programs with other institutions. The physics department provides, through a cooperative agreement, access for graduate students at the University of Missouri–St. Louis (UMSL) to its PhD program. Since 1995, the program has awarded 16 doctoral degrees and in most years 10 to 12 students are enrolled. Beyond providing a vital service to these students, this cooperative program has been helpful to the physics departments of both campuses. While Missouri S&T faculty members gain access to UMSL faculty expertise and research facilities, faculty members at UMSL have the opportunity to recruit and supervise doctoral students.

To provide greater access to its engineering programs for place-bound students in the rapidly growing Springfield metropolitan area, Missouri S&T has entered into a cooperative agreement with Missouri State University. That university has long had a strong pre-engineering program for students who would then transfer to Missouri S&T to complete their degree requirements. Beginning in the 2008–2009 academic year, Missouri State students will be offered the opportunity to complete virtually all of the degree requirements for civil or electrical engineering on the Springfield campus. The program will provide Springfield residents with access to a fully ABET-accredited degree program resulting in a diploma from Missouri S&T with the wording “in cooperation with Missouri State University.”

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<th>Table 11: MISSOURI S&amp;T SPONSORED PROGRAMS FUNDING SUMMARY</th>
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Transfer Policy

Since 1969, Missouri S&T has developed an increasing number of transfer partnerships with community colleges and four-year institutions. In 2008, Missouri S&T had transfer and articulation agreements with 54 institutions, most in the state of Missouri. Beyond its easily navigable website, the campus provides a number of services and processes for transfer students, including joint recruiting activities with partner institutions, student group tours of Missouri S&T, a Transfer Visit Day, Transfer Advising and Registration Day, Transfer Orientation, and Transfer Scholarships. These efforts have enabled a large number of transfer students to matriculate at Missouri S&T. In 1999, there were 232 new transfer students in the fall semester. In 2007 that number had grown to 276.

Meeting the Needs of Professionals

For more than four decades at its Engineering Education Center located on the University of Missouri–St. Louis campus Missouri S&T has assisted St. Louis-area working professionals, notably engineers and computer scientists, seeking to enhance their careers with an advanced degree. Through evening on-campus courses and distance learning courses via the Internet, professionals can earn graduate certificates in nineteen different programs including contemporary structural engineering, human-computer interaction, and software design. Students can also pursue master’s degrees in civil, computer, electrical, manufacturing, mechanical and aerospace engineering, information science and technology, or engineering management at the center. The number of graduate students enrolled at the center has grown from 235 in fall 2001 to 518 in 2007. Since 1999, 243 students have attained a graduate degree through the center and another 30 have graduated with a certificate.

More generally, professionals from around the globe can take one- and two-hour professional development courses or earn graduate certificates and graduate degrees through Missouri S&T’s Distance and Continuing Education Division. The division offers 27 online professional development courses, 28 graduate certificate programs, and master’s degrees in business administration, civil engineering, computer science, engineering management, environmental engineering, geotechnics, information science and technology, manufacturing engineering, mechanical engineering, mining engineering, and systems engineering. Clearly, the distance and continuing education department has responded to this constituency’s need for professional development opportunities. In 2000, just more than 200 students were enrolled in graduate courses. That figure grew to 506 in fall 2007.

Responding to the Needs of Industries

In response to the needs of the coatings industry, Missouri S&T has long been involved in an outreach program of short courses, symposia, and in-house education projects. For 50 years, professors of chemistry have offered short courses like the two five-day courses in spring 2008, “Basic Composition of Coatings” and “Introduction to Paint Formulation.” Typically, participants come from paint manufacturing companies, companies that produce pigments, polymers, solvents, and other additives, and employees of federal installations. Most of the short courses attract between 100 and 300 participants. The civil, architectural and environmental engineering department has responded to the needs of general contractors, consulting engineers, and
public agencies by offering annual conferences on asphalt and concrete. In 2007, the Asphalt Conference had more than 200 attendees from nine states representing asphalt and construction companies, municipalities, petroleum and limestone companies, and the Missouri Department of Transportation. Similarly, 139 participants from five states attended the Concrete Conference, representing cement and construction companies, engineering firms, municipalities, and the Missouri Department of Transportation.30

The Missouri S&T Institute for Environmental Excellence supports on-campus environmental related academic, environmental management, and environmental research, but it also serves a growing external constituency. In the past seven years it has participated in numerous workshops and conferences across the nation and has provided information and consulting resources to a number of public entities. Notably, its staff have shared “best practice strategies” with personnel from municipalities (primarily water and waste water utilities) as well as environmental health and safety personnel from colleges and universities.31

Missouri S&T serves area and regional industries in another important way: by providing undergraduate students with practical subject-area experiences. Every undergraduate engineering program requires a capstone senior design course. Professors solicit projects from companies, but companies also contact the university to propose projects. Students in electrical engineering, for example, have designed a health monitoring system for the brewing control equipment at Anheuser-Busch in St. Louis, designed an energy management system that scheduled heat and lighting for plant sections at Olin Fineweld Tubing in Cuba, Missouri, and upgraded the controller in an existing furnace control for Alcoa in Davenport, Iowa32.

The examples in this section illustrate how civic, business, industrial, and academic leaders seek the expertise of the faculty and staff at Missouri S&T. Between 2004 and 2007 the number of faculty reporting consulting activities increased dramatically from 66 to 140.33

Collaboration with Fort Leonard Wood

The University of Missouri established a research park at Fort Leonard Wood as part of its economic development mission. Missouri S&T hired a full-time liaison in 2003 to facilitate the relationship between the university campus and the fort whose duties include finding military research opportunities for the campus, assisting the mission of Missouri S&T’s Continuing Education program, and promoting the economic development of the “Tech Park” at the Fort. The “Show Me the Road to Hydrogen” project is an excellent example of the partnership between the university and Fort Leonard Wood, which has included an array of external constituents. The project is designed to provide a shuttle service using hydrogen-powered shuttle buses from Rolla and Lebanon to the Fort for military commuters. It will involve the construction of a hydrogen station and a study of the technical and safety issues involved in such a service and required the collaboration of the Missouri Transportation Institute, the Meramec Regional Planning Commission, the U.S. Army, the Air Force Research Lab, the U.S. Department of Transportation, the Missouri Department of Transportation, the Missouri Department of Economic Development, Ford Motor Co., Air Products Corp., and Gas Technologies Institute.34
Collaboration with K-12 Schools

Besides examining data collected by the Department of Elementary and Secondary Schools, the Regional Professional Development Center (RPDC) consults with area administrators to tailor areas of service that strengthen educational programs in the south central Missouri region. In Fiscal Year 2006, the RPDC conducted 328 regional workshops on 151 topics. The 6,827 participants represented 128 school districts and agencies and all of the 63 districts in our region. Participants also came from 57 districts outside of the region, nine private schools, and eight other community service agencies and organizations. Between July 2007 and March 2008 those numbers grew. In those months, the RPDC conducted more than 300 workshops which drew nearly 8,000 participants. The workshops explored a wide range of topics including ACT preparation, team building, non-fiction writing, working with autistic children, dealing with difficult parents, differentiated learning, a framework for understanding poverty, the disengaged learner, and measurable goals. Participants rated the usefulness of the information and their ability to use it in their classroom or educational work as an average of 4.39 on a 5.0 scale.

International Collaborations

Missouri S&T has developed agreements with a number of international universities. These mutually beneficial institutional relationships have usually developed through the professional relationships of faculty members. In some cases, they involve exchange agreements and, in others, opportunities to assist foreign scholars who are visiting S&T. The office of international affairs reviews all international linkage agreements and serves as campus liaison, providing protocol assistance with international visits. Recent linkages include Curtin University of Technology, Australia; University de Quebec, INRS, Canada; Lecole Superieur d’Ingeneur en Genie Electrique, France; University of Mines & Technology, Tarkw Ghana; Keimyung University, Korea; Koszalin University of Technology, Poland. The office of international affairs has been working cooperatively with the Mazoon College initiative since 1999. Missouri S&T faculty members have provided consultation to Mazoon College in Oman as it develops appropriate degree programs for its students. For example, the chair of the Missouri S&T economics department spent a year serving as the academic dean of Mazoon College.

WHAT MISSOURI S&T HAS LEARNED

Missouri S&T recognizes the importance of relationship building and its obligation to be responsive to the external constituencies that depend on it for service. A key lesson learned by the institution is that the excellence of Missouri S&T’s academic programs provides real value to a variety of audiences and it hopes that those external constituents will assist the university in its efforts to secure the resources needed to continue this outreach.

OPPORTUNITIES FOR IMPROVEMENT

Missouri S&T has established many successful partnerships. In establishing and maintaining these partnerships, Missouri S&T demonstrates its responsiveness to the constituents involved. Unfortunately, funding for programs is a critical challenge.
for many university programs. State funding is not a dependable long-term source for many of the activities and programs that departments provide. As time goes on, it will become increasingly important for Missouri S&T to seek outside sources of funding for programs and services. In addition, the university must discover mechanisms to institutionalize the critical programs that will sustain its contributions in these critical areas.

**CORE COMPONENT 5D**

**Internal and external constituencies value the service the organization provides.**

Internal and external constituencies are clearly identified by the institution and by individual departments and programs. The value of services provided can be measured in satisfaction surveys and by the dollars raised from external constituent groups. The value external communities place on campus outreach efforts, activities and events can be measured not only by constituent participation, but also by their expanding desire to be engaged in the continual improvement of valued services.

**● 5D WHAT MISSOURI S&T DOES BEST**

**Satisfaction of Internal Constituents**

Students, the most vital of the internal constituents, are largely satisfied with their experiences at Missouri S&T. In a spring 2008 satisfaction survey, 15 percent noted they were “very satisfied” with their experience on campus and another 42 percent said they were “satisfied.” Those figures are similar to students’ perceptions of their experiences at other midwestern universities. Compared to their counterparts at other universities, Missouri S&T students have higher satisfaction with campus safety, ease of registration, and timeliness of financial assistance awards. They also have greater satisfaction in their interactions with faculty; specifically in having access to faculty members outside of class, in their advisors’ knowledge of major requirements, and in faculty members’ “fair and unbiased” treatment of students. The greatest measure of their overall satisfaction with the campus is that 93 percent of the undergraduate and graduate students surveyed had no plans to transfer to another institution. The high degree of student satisfaction with their interaction with faculty is also reflected in the most recent National Survey of Student Engagement.

**Capital Campaign**

One of the most significant measures of the value external constituents place on the services provided by Missouri S&T is the level of support provided in the current Capital Campaign. Missouri S&T University Advancement successfully completed the Full Circle Capital Campaign in 2000, surpassing its $60 million goal to reach nearly $68 million in gifts for scholarships, facilities, faculty support and general support. More than 43 percent of Missouri S&T’s 42,000 alumni participated in the campaign. The percentage of alumni participating in that campaign is nearly double the annual alumni involvement at private institutions. Missouri S&T’s campaign resulted in endowed scholarships, two endowed chairs, endowed professorships and other endowed funds.
The impact of the Full Circle Campaign was critical in developing relationships among alumni, faculty, staff, students and friends who contributed to the campaign. Alumni contributed funds, time and energy to aid developing plans to raise the caliber of Missouri S&T's programs. Four new “academies” of distinguished graduates were established to add to the two existing groups in civil engineering and electrical engineering, representing 1 percent of the departmental respective alumni base and providing consultancy, ambassadorship, and sponsorship to academic units.
A second campaign, “Advancing Excellence: Campaign for Missouri S&T” was designed to follow on the heels of the first campaign’s success with elevated academic unit goals. A feasibility study was conducted of influential and capable alumni which found that a campaign in excess of $100 million would have to be convincingly “transformational” not simply linear or “more of the same.” The following analyses were conducted to develop this campaign plan:

- A prospective donor screening was conducted in concert with the other three UM campuses in July 2001. This analysis confirmed addresses of alumni and provided an indication of gift capacity based on publicly available information.
- Audits of the marketing program and the development operation were conducted to ensure adequate resources were available to mount such an effort (October 2001/January 2002).
- Deans and department chairs were asked to draft campaign objectives by school/college.
- A campaign “feasibility study” of 40-plus confidential interviews with alumni was conducted to determine confidence of prospective donors and reaction to draft objectives (July 2002).
- The 18-member Campaign Organizing Committee was convened in April 2003 and met four times to determine the timing, focus and goals of the campaign. The 15-member Campaign Steering Committee was appointed in July 2003 to manage the seven-year effort.
- The quiet phase of the campaign officially began in July 2003.
- The public phase began in April 2007 when $115 million was surpassed.

Missouri S&T’s endowment grew from $49 million in 1998 to $107 million in 2007. The goal during this second campaign is to achieve an endowment value of $150 million by 2010, providing an estimated $7.5 million annually to support students, faculty, programs and facilities.
Missouri S&T has achieved national recognition from various ranking sources. The campus is ranked 54th among the nation’s top public universities in the U.S. News & World Report’s “Americas Best Colleges Guidebook.” The campus ranked 48th in the U.S. News & World Report’s list of best undergraduate engineering schools in 2006. In 2008 U.S. News & World Report’s rankings of graduate engineering schools Missouri S&T ranked 70th and tied for 41st when compared with public graduate engineering schools; online rankings included four graduate engineering programs: civil engineering ranked 41st, computer engineering ranked 68th, electrical engineering ranked 57th, and mechanical engineering ranked 44th.

Missouri S&T receives national recognition for contributions made by individuals and departments. The Cloud and Aerosol Sciences Laboratory has received several technical achievement awards, including the JETS/APEX2 Technical Achievement Award 2006 given by Arnold Air Force Base, the APEX3 Recognition Award given by NASA, and the 2007 Climate Protection Award given by the Environmental Protection Agency. Researchers within this laboratory are invited to present at national and international meetings and conferences. The division of university advancement’s marketing departments received 10 awards from the Council for the Advancement and Support of Education (CASE) in 2007. The division received 13 awards in 2008 for excellence in alumni relations, media relations, publications, social media, web design and overall marketing, communications and institutional advancement. They also received two gold awards for excellence in multimedia online alumni recognition.

Over the past 10 years, 46 percent of the cash received has been endowed, approaching the Advancing Excellence Campaign goal of endowing 50 percent of cash gifts received.
magazine and for its Experience This! blog (experiencethis.mst.edu) which promotes Missouri S&T's student design team activities. Advancement received several gold awards, two silver awards, and two bronze awards for various publications and marketing initiatives.

Services provided by Missouri S&T departments and programs are valued and sought after by corporate, civic and business leaders and can be evidenced by external funding received. The Office of Sponsored Programs enhances and facilitates research and external funding by providing services to all persons involved with sponsored program activities. In 2006 the office of sponsored programs submitted 485 proposals with a total of 326 awarded to Missouri S&T departments and programs. The total dollar amount awarded to Missouri S&T programs in 2006 was $32,030,392. The high regard in which funding agencies hold the work of Missouri S&T researchers is evident in local, state, federal and international recognition through contracts and agreements awarded to the Environmental Research Center (ERC) and Emerging Contaminants. The Environmental Research Center (ERC) and Emerging Contaminants receives a strong and increasing level of external research funding. The ERC investigators are requested to give presentations to state, federal and international audiences on a wide range of environmental technological issues.

In addition, the ERC has been the catalyst for important international cooperative agreements with many international institutions and governments such as Harbin Institute of Technology, Harbin, China; Tongji University, Shanghai, China; and Hong Kong University of Science & Technology, Hong Kong and China.

**Value Placed on Missouri S&T Economic Development Activity**

In recent years, the University of Missouri System has added a fourth fundamental mission to the traditional teaching, research, and service missions. Recognizing that the “new economy is knowledge-based, global and entrepreneurial,” the university “established its fourth mission of economic development to signify the sense of responsibility for the state’s economy.” Of particular concern in this mission is technology transfer. Committed to “move as many technologies to the market as possible,” the university “intends to foster start-up companies, which bring knowledge-based workers, accelerate the dynamics of the economy and attract venture capital to Missouri.” The university has established “business incubators and research parks as welcome tools to help establish more entrepreneurial activity surrounding their campuses, their faculty and their students.”

Missouri S&T responded to the call for this new mission by establishing the office of technology commercialization and economic development, which houses both a technology transfer office and a Center for Entrepreneurship and Outreach. Both work closely with the University of Missouri office of research and economic development providing “responsive, professional service to our faculty, students, and industry partners to facilitate the creation of wealth, jobs and opportunities for faculty, staff, students and business within the state of Missouri and the world.” Analysis of potential opportunities to form a start-up business with Missouri S&T's technology and assistance in applying for federal Small Business Innovative Research (SBIR) and Small Business Technology Transfer (SBIT) Program grants are among the many services rendered by these offices. For example, in 2007, Mo-Sci Corp., a local company specializing in “precision glass technology,” specifically “quality glass
microspheres, powders, chopped or continuous glass fibers,” drew upon the expertise of the center in “submitting a Phase II STTR as well as follow-on SBIR for technology development.”

Beyond these efforts, Missouri S&T has established a Technology Development Center within its new Research and Technology Park. As with the office of technology commercialization and economic development office, this “Innovation Park” will facilitate campus “collaborations in advanced technologies with business and government,” “help entrepreneurs bring ideas to the marketplace,” and “promote outreach activities to high schools, colleges, and the community.” The campus anticipates “corporate, regional and divisional headquarters of technology-based or knowledge-driven companies” would locate in the park. Within months of the establishment of the Innovation Park, the campus announced that GE Aviation had selected Missouri S&T for its University Development Center. “An operating unit of General Electric Co.,” GE Aviation began by considering nearly 400 universities and invited 10 to submit proposals. The company selected S&T because its “curriculum and academics … are complimentary to the skill set and requirements” of the company’s “aerospace programs.”

**Community Participation in Campus Activities and Events**

The campus supports a wide range of athletic and cultural programs and events that are open to the public and are well-received by the communities the campus serves. During the past three years, the intercollegiate athletics program at Missouri S&T has made outstanding progress and achieved a great deal of success. The competitive level in virtually every program has improved and the academic and athletic achievements of Missouri S&T student-athletes continue to be exemplary. A critical component of the program’s success is directly related to a decision to change conference affiliation to the Great Lakes Valley Conference, an NCAA Division II conference with 14 members in five states. The last three years have been outstanding. A total of 183 all-time team and individual records have been set in the past three years. In the past year alone, 65 records were broken. Academically, the student-athletes continue to excel in the classroom.

Average attendance over a three-year period for athletics demonstrates the value of these programs for the campus and community. The men’s basketball events have an average attendance of 600 and women’s basketball events has an average attendance of 431. The average attendance of football games is 2,645 students as well as campus and community supporters.

The community’s interest in cultural programming can be verified by attendance records of public events and performances. Most of the cultural events at Missouri S&T are held at Leach Theatre, which has a maximum seating capacity of 600. Several cultural/performance series are open to the public, including the Campus Performing Arts Series, the Missouri S&T Family Series, Remmers Special Artist-Lecturer Series, a weekly Free Film Series, and a public school outreach program. Attendance at these events is about 60,000 annually.

The Family Series is particularly important public outreach service to the local community. The target audience for the school outreach program is elementary and secondary school children from the surrounding area. Last year more than 5,400 students and teachers attended, coming from schools at Fort Leonard Wood (an Army
base 25 miles away) as well as Salem, St, James, and other nearby communities. The university also encourages the local Boys and Girls Town to get involved with the school outreach series and often has a large group of home educators in attendance, as well. Through a grant, the university was able to provide $4,000 towards subsidized busing to the theatre in 2007 and 2008. The 2007 season was the largest to date as a result of the bussing grant. In many of the counties served, 60 percent of the children come from below poverty-level income homes and would not likely have the opportunity to see live theater without the university programs. The public performances also provide top-quality entertainment and exposure to the arts for the community at affordable ticket prices.

**Community Use of Missouri S&T Facilities**

One critical measure of the value that the community places on services provided by the campus is their willingness to use its facilities. The Havener Center is clearly the community’s favorite campus facility. In the 2007–2008 academic year, there were 160 events scheduled by 64 different off-campus organizations. In all, about 12,000 attended those events. This represented about 10 percent of all scheduled events in the facility. Based upon attendance at scheduled events and use of the food court and bookstore, it is evident that about 10 percent of the 460,000 patrons of the center were from off campus.

Curtis Laws Wilson Library also is popular with external constituents. Library services are available to all community visitors during the hours the library is open. Patrons are able to use both print materials and electronic resources and reference services are provided without regard to a patron’s affiliation. As a government depository library, the library is legally bound and committed to providing the same level of service and access to its government documents collection to external users as it is to its internal constituencies.

Two notable examples of external constituencies’ use of Wilson Library are its long-term association with National History Day students attending Rolla Junior High School and “guest patron” lending. The National History Day collaboration has existed for at least 20 years. Junior high teachers, librarians, and students intensively learn about and use the library for two days at the beginning of their spring semester to learn how to use our resources and gather material for the competition. Active participation averages around 45 students per day each year, with 100 as the total for 2007 and 80 students visiting during 2008.

Guest patron accounts are issued to individuals who have no university affiliation. The average number of new guest patron accounts issued each year has been nearly 150. As a snapshot estimate, around 10 percent of the items checked out were used by guest patrons. In both these ways, the university library serves as an important resource for the surrounding community.

**Co-curricular Activities and Competitions**

External constituents participate in Missouri S&T activities and the co-curricular programs that are open to the public. For example, The Missouri S&T Center for Pre-College Programs supports several programs designed to increase the number and diversity of students prepared to enter college and successfully pursue math, engineering, technology and science programs:
1. math, engineering, technology and science summer programs and camps
2. academic year workshops
3. in-school math, engineering, technology and science programs
4. state and regional academic competitions
5. sports camps

5D WHAT MISSOURI S&T HAS LEARNED

Missouri S&T is committed to working with its various constituencies, as outlined in its mission, vision and core values. Departments and programs learn from the communities they serve. Clearly identified internal and external constituencies participate in evaluations and assessments that provide valuable feedback that allows continual improvement to services and programs offered.

5D OPPORTUNITIES FOR IMPROVEMENT

Employee Satisfaction

Missouri S&T Staff Council conducts an annual survey of all staff members. All responses are confidential and a summary is provided to the chancellor and the campus community. Data from the 2007–08 staff survey indicates problems with morale. About half of those responding believe morale is poor or needs improvement while barely 20 percent perceive staff morale as excellent or good. More than 70 percent are satisfied with their job duties and more than 60 percent are not actively seeking another position either on or off campus. However, most do not believe that their pay is comparable to fair market value nor do they know how raises are determined. Clearly, those concerns need to be addressed for Missouri S&T to truly be the employer of choice for its staff.

The campus has begun to develop better ways to interact with parents of its students to measure their level of satisfaction. Currently, parents respond to a survey when they accompany their sons and daughters to the Preview, Registration and Orientation Programs. On a scale of one to five, the parents who attended the nine PRO sessions in 2007 gave the campus an assessment of 4.5 for its orientation and registration process. This is a critical consideration given that the number of parents attending these sessions has grown much more rapidly than the number of students attending. In 2000, there were 615 “guests” and in 2007, there were 1,703. In late 2007, the campus Retention Committee began exploring ways to address parental involvement including a web site for parents and developing a parents’ newsletter.

Missouri S&T needs to develop more meaningful ways to measure faculty satisfaction. We are aware that the turnover rate of our faculty is slightly higher than the national average. An analysis of exit interviews with faculty members who leave for positions at other institutions could provide some insight into their reasons for departing.
SUMMARY OF FINDINGS

STRENGTHS
Missouri S&T engages numerous internal and external constituencies. The university is responsive to its constituents’ needs and makes good use of its available resources to provide valuable services. The challenge for the campus is to be wary of over-commitment to external constituents in an era of scarce resources. Beyond the additional resources that entrepreneurial, distance education, and workshop activities can produce for the campus, perhaps the most meaningful reason to engage ever more constituencies can be found in the opportunities those engagements can provide for students. Besides the internships, co-ops, and proposed externship programs which help students prepare for their careers, there is an ever larger opportunity for service activity for students. Indeed, the campus is committed to enhancing “service learning” as a key component of the undergraduate learning experience, one that will contribute to a commitment to lifelong learning. As more professors link service-learning activities to academic course objectives, the campus anticipates greater success in its promotion of student leadership and effective citizenship development.

CHALLENGES
The challenge for the campus is to maintain a balance of the commitment to external constituents in an era of scarce resources. While the campus must always be mindful that its services and facilities are in ever greater demand by external constituents, Missouri S&T cannot neglect the needs of its internal constituents. Notably, the campus must address the low morale of the staff and seek ways to measure faculty satisfaction.
Endnotes

1. http://advancement.mst.edu/boardoftrustees/
2. http://giving.mst.edu/corporatedevelopmentcouncil/
5. http://emgt.mst.edu/academyofengineeringmanagement/ENG_MGT_Academy_home.html
9. Caroline Fisher to Larry Gragg, July 7, 2008, email
11. http://accreditation.mst.edu/evidencecollection/criterion5/South_Central_Reg_Prof_Develop_Criterion5Form.doc
12. http://career.mst.edu/
13. COC Accreditation Information (Revised June 19, 2008)
14. S&T Leadership Development Externship Program
17. http://www.ice.gov/sevis/i901/
20. http://sponsoredprograms.mst.edu/
CRITERION FIVE


31 http://iee.mst.edu/components.html and Harvest Collier to Larry Gragg, June 21, 2008, email

32 Kelvin T. Erickson to Larry Gragg, June 18, 2008 email

33 Faculty Accomplishment System Data, 2004–2007 in Resource Room.

34 http://sponsoredprograms.mst.edu/flw_liaison.html; http://magazine.mst.edu/2006/09/getting_on_board.html; and Stephen Tupper to Larry Gragg, June 25, 2008, email

35 http://accreditation.mst.edu/evidencecollection/criterion5/South_Central_Reg_Prof_Devl_Ctr_Criterion5Form.doc or http://rpdc.mst.edu/index.html

36 http://accreditation.mst.edu/evidencecollection/criterion5/South_Central_Reg_Prof_Devl_Ctr_Criterion5Form.doc

37 SC RPDC Workshops, 3/27/2008

38 http://accreditation.mst.edu/evidencecollection/criterion5/International%20Affairs_Criterion5Form.doc

39 Responses from Students who participated in the Student Satisfaction Inventory Survey in Spring 2008.

40 http://admissions.mst.edu/explore/explore_ataglance.html

41 http://accreditation.mst.edu/evidencecollection/criterion5/CASL-COE_Criterion5form.doc

42 http://news.mst.edu/news/2006/CASE06.html


45 http://accreditation.mst.edu/evidencecollection/criterion5/ERC_criterion5form.doc

46 Meeting the Challenge: Economic Development & the University of Missouri, pp. 3, 4, 7, and 8

47 http://ecodevo.mst.edu/info/aboutus.html

48 http://www.mo-sci.com and Keith D. Strassner to Larry Gragg, June 18, 2008, email


50 http://campus.mst.edu/sports/

51 Criterion Five Submission of Student Life

52 http://leachtheatre.mst.edu/family_series/

53 Criterion Five Submission of Student Life and Mark Potrafka to Larry Gragg, June 25, 2008, email

54 Criterion Five Submission, Curtis L. Wilson Library and Andy Stewart to Larry Gragg, June 24, 2008, email

55 http://precollege.mst.edu/gradelevelchart.html

56 http://precollege.mst.edu/mets/index.html

57 http://precollege.mst.edu/inschoolprograms/index.html

58 http://precollege.mst.edu/inschoolprograms/index.html
http://precollege.mst.edu/competitions/index.html
http://dce.mst.edu/noncredit/precollege/index.html
Missouri S&T Staff Council Open Forum, 2008
Preview, Registration and Orientation Programs, Review of 2007 Programs
Missouri S&T Retention Committee Meeting, November 29, 2007
6: FEDERAL COMPLIANCE AND INSTITUTIONAL SNAPSHOT
The self-study report, the last two annual financial audits, the most current undergraduate and graduate catalogs, and the faculty and student handbooks will be provided to the Higher Learning Commission staff liaison and to all visiting review team members. The self-study materials will also be available in the Office of Undergraduate Studies and in the accreditation visit resource room.
CREDITS, PROGRAM LENGTH AND TUITION

Credits and Program Length
Missouri University of Science and Technology operates on the semester system with student learning experiences measured in credit hours. Most undergraduate Bachelor of Science degree programs require a minimum of 128 credit hours, while the Bachelor of Arts degree programs require a minimum of 120 credit hours. Most programs are designed so that a student starting a program as a freshman can finish it in four to five years by satisfactorily completing an average of 15 credits a semester. Students are encouraged to enroll in a cooperative work program for eight to nine months, which may extend their stay at Missouri S&T. Missouri S&T coursework appearing on a transcript is graded in accordance with the policies found in the Student Academic Regulations. Missouri S&T does not provide narrative evaluations or simply list courses as “completed” on a transcript.

Missouri S&T is also a member of the American Association of Collegiate Registrars and Admissions Officers (AACRAO). The mission of AACRAO is to provide professional development, guidelines, and voluntary standards to be used by higher education officials regarding the best practices in records management, admissions, enrollment management, administrative information technology, and student services.

Tuition
The appropriation process within the state of Missouri includes the comparison of tuition levels and fees for Missouri universities. Tuition and fees, taxes, and housing rates are provided in detail on Missouri S&T’s website.

Institutional Compliance with the Higher Education Reauthorization Act
Missouri S&T complies with Title IV requirement of the Higher Education Reauthorization Act as amended in 1998. The Missouri S&T fiscal year 2005 Federal Stafford Loan default rate was 3.3 percent; the fiscal year 2006 default rate was 2.1 percent; and the fiscal year 2007 default rate has not yet been determined. Additionally, Missouri S&T’s financial statements and audit reports are available for review in the resource room and on the institutional research and assessment website. The office of financial aid also posts institutional financial aid policies on its website.
Finally, as required by federal regulations, Missouri S&T’s websites contain information on:

- Graduation Rates
- Safety and Security (Jeanne Clery Disclosure)
- Equity in Athletics
- Federal Compliance Visits to Off-Campus Locations
  Missouri S&T does not operate any facilities outside of the state of Missouri or outside of the United States that meet the HLC/NCA definition of an off-campus site. The university does operate two in-state, off-campus locations: the Engineering Education Center in St. Louis and a military education center at Fort Leonard Wood.

Institution’s Advertising and Recruitment Materials
Missouri S&T’s accreditation status is described in its catalog: “The university has been accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools,” and the HLC/NCA web address and local phone number for HLC/NCA are also provided. The same language appears on the institutional research and assessment website, Missouri S&T’s accreditation website, and on numerous other university websites. The accreditation website also includes a link to the HLC/NCA website for contact purposes and includes the HLC/NCA web address and local phone number, as required by HLC/NCA policy.

Professional Accreditation
Professional agencies that accredit various programs at Missouri S&T are listed on the institutional research and assessment accreditation website.

Requirements of Institutions Holding Dual Institutional Accreditation
Missouri S&T does not hold dual institutional accreditation.

Institutional Records for Student Complaints
The office of student advocacy and judicial affairs in the division of student affairs handles student complaints in a timely, independent, confidential and neutral manner. Through the role of the student advocate, the division of student affairs has shown its commitment to ensuring that students succeed in the pursuit of their academic, career and professional development. The student advocate has access to an array of materials, university offices, on- and off-campus resources, and other information that can assist students in finding resolution to their concerns.

Issues addressed by student advocates include, but are not restricted to:

- Delineating university policies and procedures
- Assisting students with intellectual pluralism, viewpoint tolerance, or diversity concerns
- Assisting students in understanding their rights and responsibilities
- Listening to questions, concerns and complaints
- Assisting in evaluation of options to address student concerns
- Referring students to the appropriate support services or resources
- Advising students about steps to resolve problems informally
- Advising students about formal and administrative options
- Serving as liaison in emergency situations
Student concerns during the 2006–2007 academic year, as recorded by the student advocate, fall into two categories: academic and non-academic. During this time period, student advocacy provided services to a total of 175 students. Nearly 6.9 percent of the contacts with the office concerned academic issues, led by various instructional issues including conflicts over grades, examinations, course policies, and instructional methods. Of the non-academic concerns, more than 58 percent of the contacts dealt with personal issues, including health or emotional related concerns or with family crisis. A report detailing the actions of student advocacy services is provided annually to the vice chancellor for student affairs.

The office staff follows the policies and community standards established by the university. The names of those contacting student advocacy services are not released without the permission of the student. To assist students, the office will refer them to appropriate resources on campus, explain relevant rights and responsibilities, review relevant policies, and present options for resolving conflicts.

Student advocacy services also assists students and administrators in grievance hearings, the final step in the complaint process on the Missouri S&T campus. In the 2006–2007 academic year, the office received five contacts regarding potential grievances. After intervention, all were resolved informally and no cases were heard formally by a hearing committee.
ENDNOTES

1 http://registrar.mst.edu/academicregs/index.html
2 http://sfa.mst.edu/costs/index.html
3 http://ira.mst.edu/accreditation.html
4 http://sfa.mst.edu/federalprogs/fin-aid-polices.html
5 http://ira.mst.edu/documents/59_fb0506_umr.pdf
6 http://police.mst.edu/securityact/
7 http://ope.ed.gov/athletics/InstDetail.asp
8 http://accreditation.mst.edu/index.html
9 http://www.ncahlc.org/index.php
10 http://ira.mst.edu/accreditation.html
11 http://studentadvocacy.mst.edu/
12 http://communitystandards.mst.edu/greviance_form.html
Missouri University of Science and Technology has fulfilled its objective of constructing a self-study that candidly and fairly captures the essence of the institution today. This is important not only for the purposes of the Higher Learning Commission, but also for the entire campus community.
7: SUMMARY OF FINDINGS

> Missouri S&T is an institution in transition. The nature of that transition is much clearer to us now than when we began the self-study two years ago. We recognized at the start that there were challenges to our efforts to strengthen the learning environment for students and to provide the diverse services our many constituencies desire. At the conclusion of this self-study process, we understand the issues before us to a greater extent, know our considerable strengths, and have identified some of the opportunities for making the improvements necessary to achieve our vision. As the process unfolded, we also clarified many things about Missouri S&T that were not obvious two years ago, but which consistently emerged as themes from the various committees working on the self-study and in the conversations held with the campus community. In our final analysis, we recognize the stresses and strains typical of any organization in transition, but see that, overall, we are progressing well. In this final discussion, we provide an overview of the institution’s strengths, weaknesses, and issues for the future, culminating in our request for full re-accreditation.

● STRENGTHS

Missouri S&T’s commitment to seek and continuously improve the quality of all that we do is a strength that is reflected in the process of conducting this self-study. The institution’s key strength has always been, and will continue to be, the high priority put on students and the high quality of education provided. Knowing it would not be the easiest route, Missouri S&T chose to use the self-study process to gather key institutional data and the resulting analyses of strengths and concerns, undisguised by rhetoric or spin, and to engage the campus in frank conversations regarding these findings as a way to focus on the future. This approach has already aided the institution immensely and will continue to provide benefits throughout our interactions with HLC consultant evaluators and from the commission’s feedback.

The self-study process itself reflected another key institutional strength — the willingness of many within the Missouri S&T community to contribute their time and expertise to improving the institution and its core educational mission. There were more than 15 Missouri S&T faculty and staff who served on the self-study steering committee and sub-committees and who supported this work in various ways. More than 75 faculty and staff attended open discussion sessions, provided requests for data and information, or read and provided input on the various drafts of the chapters. Dr. Harvest L. Collier added the responsibility for leading the self-study effort to his existing roles as vice provost for undergraduate studies and professor of
chemistry for two years. These contributions were made on behalf of Missouri S&T and with desire to help the institution realize its potential.

From the self-study process emerged the comprehensive, evidence-based and candid analysis of Missouri S&T today that is summarized in this document. Many readers of the self-study have come away from it with a positive impression of the institution. Missouri S&T is a solid institution, with many things to be proud of which, we believe, is worthy of continuing accreditation. Missouri S&T's values and its commitment to the learning of its students will certainly facilitate meeting the goal of becoming one of the top five technological research institutions in the country.

**CHALLENGES**

As Missouri S&T's strengths have become more evident, the challenges we face also have come into sharper relief. A deficiency echoed throughout the self-study — the lack of centralized, systematic, long-term, coordinated planning and budgeting — is something that must be addressed and we have already begun investigational efforts and preliminary planning in that direction. Admittedly, short-term perspectives are to be expected in an environment that has seen swift leadership changes and reorganization in recent years. Nevertheless, the lack of long-term planning limits Missouri S&T's effectiveness. Prior experiences with institutional planning incorporate a tactical plan to carry out the new Strategic Plan, primarily aligning important financial decisions with the plan.

There is great interest in the focus implied by the new Strategic Plan. Missouri S&T cannot be all things to all people. We do, however, want to be innovative and continue to improve and develop in key areas. To do so requires effective decision-making. By definition, new directions will be pursued and some abandoned. Tough decisions, which will be unpopular with some, and sometimes with many, will certainly have to be made and carried out. Those decisions should include thorough analysis and appropriate input from individuals who are given access to the information they need. Once decisions are made, implementation should proceed in an expeditious manner.

Underlying the difficulties with decision-making is a sense of uncertainty. Although the overall level of uncertainty has been decreasing in recent years, it can still be particularly acute within certain units and at various points through time. When such uncertainty exists, it undermines communication and sharing, the cornerstones of effective shared governance, and the effectiveness — or perceived effectiveness — of decision-making. It also makes it difficult to revise decision-making processes, resulting in processes that remain in place although they have outlived their usefulness as Missouri S&T has grown and changed and the demands for responsiveness to rapidly changing external environments have increased significantly.

Another theme that emerged through the self-study process is that Missouri S&T collects impressive amounts of information about itself and in comparison to other institutions, but use of and communications regarding these rich sources of evidence have been limited, indicating the campus does not benefit fully from these efforts. Our staffing levels, limited budgets, and institutional culture all contribute to this situation — one which we have already taken steps to correct by filling the open
position for director of institutional research and assessment in 2007. The self-study provides a good example of data collection and analysis that will benefit Missouri S&T in the future. Toward that end, aspects of the self-study have already served, and are currently serving, as the foundations for future focused conversations, plans and actions. The self-study outlines actions to address some of our identified shortcomings.

The Missouri S&T community also needs to remember that plans are not enough. The self-study’s discussions of diversity remind us of this reality. Missouri S&T has had in place diversity-related priorities and plans, but our on-campus accomplishments, like the increasing the ethnic diversity of the student body and the number of students studying abroad, have been modest. Although the ethnic diversity of the south-central Missouri region limits what can be achieved in the immediate Rolla area, Missouri S&T has the opportunity to contribute to the accomplishment of statewide and national diversity agendas. Missouri S&T should aggressively address diversity in its curriculum and programming — in fact, Missouri S&T is compelled to do so as we seek to prepare students for life and work in an increasingly global and diverse society and to contribute to the education and cultural enrichment of the south-central Missouri region.

Questions for the future were raised by this self-study. What kind of institution will Missouri S&T be in the future? How do we preserve the best of the past while we evolve and prepare for the opportunities of the future? Do we have sufficient vision, communication and integrity during this period of transition to bring about and sustain important changes? Will the institution set a course that will energize all who must be engaged? Will we have the integrity to truly pursue our mission despite difficulties?

As a result of the self-study and our discussions surrounding it, Missouri S&T is already taking on some of these challenges. The directness with which those challenges are laid out in the self-study compels Missouri S&T to address them. It is hoped that this same directness will provide the HLC consultant evaluators with a strong foundation for providing the consultation we seek on both the validity of our self-evaluation and advice surrounding the challenges and transition we are undergoing.

● MISSOURI S&T’S FUTURE

As this self-study report documents, many transitions are taking place at Missouri S&T. Some are intentional changes in emphasis, such as the vision of becoming a top-five technological research university by 2011 and increasing our assessment of student outcomes. Some are responses to the changing needs of society. Others are responses to the changing needs and expectations of Missouri S&T’s 6,000 students, such as the establishment of a First-Year Experience and the two residential colleges. Missouri S&T’s growing pains are evident in the self-study, as are the commitments of dedicated faculty and staff to bettering the institution and the pursuit of Missouri S&T’s vision of achieving national prominence through its accomplishments in academic excellence, research, and public service. As we look forward from this self-study process, we are confident in Missouri S&T’s future because the campus community has demonstrated the capacity to be future-oriented, learning-focused,
connected and distinctive — the themes identified by the Higher Learning Commission as characteristic of strong institutions.

**Future-Oriented**
Missouri S&T is increasingly focused on the future. Our stated mission guides everything we do, including the recent name change and organizational reorganization. We increasingly look externally for advice, analysis and predictions regarding future societal trends and the needs of our students so that we can better prepare them for the future.

**Learning-focused**
Efforts to continually assess and evaluate every aspect of our operations have been invigorated and are increasingly sophisticated; results are used in decision-making. As we learn about our effectiveness, we are especially interested in evaluating student learning and are working to increase and improve our specified desired learning outcomes at every level of our academic programs. The scholarship of our students and faculty continues to expand, deepening the learning of students and faculty.

**Connected**
Our progress can, in part, be attributed to the strong connections we have built with our international, national, state, regional and local communities and stakeholders. The Miner Alumni Association represents and serves nearly 50,000 graduates and former students. Missouri S&T has done very well in serving the global community by providing a high-quality technical education to our students and in creating invaluable partnerships with stakeholders. These partnerships are valued and nurtured and remain a priority within Missouri S&T.

**Distinctive**
Missouri S&T is a truly distinctive university. Our vision of becoming a top-five technological research university by 2011 is challenged continually as the world changes. Our ability to reach and maintain that goal will depend on our ability to learn, increasingly using data and an external focus as important ingredients in our decision-making processes. Missouri S&T has always been willing to be accountable to formal external review. Increasingly, we must also be accountable internally, addressing key issues in decision making and uncertainty and being willing to make and carry out tough decisions to assure that The Missouri S&T of tomorrow will still be the distinctive and valued organization it is today.

As the institution moves forward, Missouri S&T’s capacities in each of these areas will certainly need to be strengthened and modified, as they need to be at all higher education institutions. Missouri S&T is prepared to address those challenges and to more fully realize its mission.
Missouri S&T Request for Re-Accreditation

By completing this self-study, providing other required documents, and hosting the February 2009 visit by HLC consultant evaluators, we believe Missouri S&T has satisfied the requirements of the re-accreditation process. This document’s foreword summarizes actions taken by Missouri S&T relative to the issues raised during our last accreditation visit. We believe that previous concerns have been addressed. Chapters one through five summarize the evidence related to the criteria for accreditation. Chapter six summarizes actions taken towards federal compliance and contains the information requested for the institutional snapshot. Evidence that Missouri S&T satisfies each of the criteria and core components for re-accreditation is provided in this document. Therefore, Missouri S&T requests continuing accreditation for the maximum 10-year period.