MISSISSIPPI
SCIENCE & TECHNOLOGY
PLAN

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ACKNOWLEDGEMENTS

Formed in 1986, the Mississippi Research Consortium (MRC) includes Mississippi's four research universities: Jackson State University, Mississippi State University, the University of Mississippi, and the University of Southern Mississippi.

The Mississippi Research Consortium aims to develop and sustain nationally competitive research programs in the state of Mississippi. Alongside supporting basic and applied research, the consortium has several additional goals: first, to increase public awareness of science, engineering, and mathematics at all educational levels to develop a scientifically literate citizenry who can fuel the science and engineering industry in Mississippi with the state's own human resources; second, to establish and maintain a solid scientific infrastructure in our university system by developing equipment and facility resources, collaboration resources, private sector links, and federal laboratory partnerships; and third, to expand the state's economic opportunities through technology and knowledge transfer, including greater commercialization, increased technical assistance, and the education of a workforce that can support technology-based industries.

- Excerpt from www.msresearchconsortium.org

MISSISSIPPI SCIENCE AND TECHNOLOGY PLAN

Over the past decade tremendous advances have been made in the development and growth of Mississippi's knowledge-based economy. As a state, Mississippi has untapped potential to improve its economic base by building upon the existing science and technology related assets within both higher educational institutions and private industry.

To help position the state to be competitive in the global economy, identifying opportunities that build upon the unique assets within the state is critical. The Mississippi Science and Technology Plan (S&T Plan) provides a roadmap for capitalizing upon our state's knowledge-based strengths and suggests potential strategies to move the state forward. The purpose of the plan is to serve as a guide for fostering collaborative efforts between state agencies, higher education institutions, the business community, and private industry that will help grow and enhance the state's science and technology driven economy. Additionally, the S&T Plan aims to create opportunities for economic development and advance education by building a stronger foundation for research, innovation, and Science, Technology, Engineering, Arts, and Mathematics (STEAM) education in the state.

The S&T Plan builds on Mississippi's competitive advantages and leverages existing resources in an effort to diversify the state's economy. Intended to provide a shared framework for discussions about how to move Mississippi forward, the S&T Plan focuses on three strategic priority areas for the state.

3 State Priority Areas

1 Grow research and development infrastructure, capacities, and resources to promote the expansion of Mississippi's emerging technologies, establish a knowledge-based economy, and maximize the state's global competitiveness.

2 Increase and diversify human capital and talent creation, retention, and repatriation.

3 Foster Mississippi's knowledge-based economy through the support of innovation, entrepreneurship, and advancement of intellectual property.

The S&T Plan works from the fundamental tenet that foundational, enabling, and translational research by higher education institutions must play a critical role in moving Mississippi forward economically and socially. The plan also establishes priorities from which the state can leverage its existing resources into strategic investments that improve the quality-of-life for all Mississippians.

STATE PRIORITY AREA 1

Grow research and development infrastructure, capacities, and resources to promote the expansion of Mississippi's emerging technologies, establish a knowledge-based economy, and maximize the state's global competitiveness.

The foundation of growing R&D efforts is to ensure that the proper infrastructure is in place throughout the state of Mississippi. This infrastructure could include physical spaces such as laboratories and research facilities; upgraded technology and equipment; and incentives for research personnel and staff.

Increasing investment in R&D infrastructure, as well as identifying strategic collaborations among higher education institutions, state agencies, and private organizations, enhance the capacity for STEAM R&D throughout the state. Specific focus should be placed on areas of emerging technologies:

- *Advanced Materials*
- *Autonomy*
- *Agriculture*
- *Biomedical/Healthcare*
- *Data Science*
- *Logistics*
- *Sensors and Diagnostics*

Objective 1.1 Increase public and private R&D investments, with an emphasis in areas of emerging technologies

Potential Strategies

- Promote collaborative projects amongst MRC institutions to pursue external funding

- Develop and secure a steady and sustainable stream of public and private investment into R&D infrastructure and capacity

- Invest resources to build capacity in areas of emerging technology

- Establish federal funding to leverage the defense related R&D assets in the state and remain competitive with other defense economy states

Potential Success Metrics

» Increase the amount of R&D expenditures

» Increase the number of R&D contracts

Objective 1.2 Establish infrastructure that fosters university-based R&D

Potential Strategies

- Foster, develop, and support both physical and operational R&D infrastructure within each individual research institution

- Establish a shared, system-wide major instrumentation core (physical and administrative infrastructure)

- Establish an external-facing, system-wide, research engagement portal

- Establish a system-wide cloud computing platform that leverages the MissiON network

- Develop an online science and technology directory through the MRC

- Promote high-tech job growth through the use of critical infrastructure and emerging technologies

Potential Success Metrics

- » Increase R&D infrastructure

- » Increase number of research centers and institutes at MRC institutions

Objective 1.3 Promote collaboration and build strategic alliances among research institutions, state agencies, and public and private organizations

Potential Strategies

- Create a network of MRC core research centers to facilitate collaboration and industry partnerships

- Develop research infrastructure to allow for the co-location of public/private/university resources in order to promote collaboration and innovation

- Promote the discipline of Team Science in order to bring together intradisciplinary groups to spur cross-sector research

- Leverage expertise and resources across sectors to the research institutions to engage in translation, innovation, and strategic partnerships

- Build strategic alliances and research collaborations among business, entrepreneurs, government, non-profit entities, and academia

- Actively partner with colleges and universities to maintain current awareness of workforce capacity, research and development milestones, and key educational offerings for the state

- Foster connectivity and alignment between institutional science and technology strategies and state-wide strategies

- Support partnerships and alignment with the science and technology-related goals of states within the southern and southeastern regions

- Capitalize on programs to link research universities, nonprofits and government assets to help eligible individuals in developing emerging technologies

- Market and leverage university resources for collaboration with private industries and community colleges

Potential Success Metrics

- » Increase the number of projects between MRC institutions

- » Increase the number of collaborative projects between MRC institutions, industry partners, and Mississippi Development Authority

STATE PRIORITY AREA 2

Increase and diversify human capital and talent creation, retention, and repatriation.

A key factor of economic growth within a state is the knowledge and skills of workers available in the labor supply. Providing educational and skills training opportunities for citizens of Mississippi is critical to attracting and retaining high-paying jobs and growing the state's economy.

Encouraging and supporting STEAM-related initiatives is critical to building, growing, and recruiting the workforce necessary to strengthen Mississippi's economy. STEAM-related education develops and fosters a skillset that stresses critical thinking and problem-solving abilities and encourages innovation. Developing, attracting, and retaining a diverse workforce that matches the needs of Mississippi's current and future employers is paramount. Aligning efforts of universities, community colleges, K-12 schools and early childhood education around STEAM-related initiatives is necessary to develop the critical skills and brainpower needed to support economic development efforts.

Objective 2.1 Develop processes, policies, and procedures to ensure diverse human capital development

Potential Strategies

- Develop processes and mechanisms for cluster hires of qualified personnel (both faculty and staff) from diverse groups

- Establish policies and procedures to ensure diverse faculty and staff retention and professional development

- Revise promotion and tenure policies and practices to include new metrics related to innovation

- Create intentional, equity-based talent recruitment and development processes and policies

- Assess the current system for potential barriers to cultural, accommodation, and programmatic accessibility

- Develop strategic partnerships with Historically Black Colleges and Universities (HBCUs) and other institutions with large populations of minorities and highly trained talent

- Develop a program to attract world-class researchers to Mississippi in key clusters based on identified emerging technologies

Potential Success Metrics

» Increase the number of cluster hires

» Increase the number of policies and procedures designed to incentivize and retain diverse faculty

Objective 2.2 Increase access to Science, Technology, Engineering, Arts, and Math (STEAM) related activities and opportunities in K-12 and higher education

Potential Strategies

- Provide STEAM based programs in K-12 that fosters Mississippi's emerging technologies and promotes MRC universities

- Foster the development of additional STEAM K-12 teachers throughout the state

- Develop human capital among diverse groups underrepresented in STEAM degree completion and STEAM workforce

- Provide opportunity to enhance the skills of research faculty in STEAM related fields

- Design and promote STEAM training opportunities and education within higher education

- Promote increased STEAM degree completion among underrepresented groups

- Develop and deploy K-12 curriculum to promote STEAM fields

- Establish lines-of-sight to introduce students and parents to STEAM career opportunities and integrate STEAM needs into MS's educational system through increased involvement of private-sector industries and public-sector STEAM employers

Potential Success Metrics

» Increase in STEAM-related educational training opportunities

» Increase in STEAM related enrollment

Objective 2.3 Increase STEAM related skills of both future and existing workforce

Potential Strategies

- Develop experiential and lifelong-learning programs to develop the workforce for the industries of the future

- Launch leadership development and workforce retraining programs that meets the human capital needs of technology intensive companies

- Support digital education and coding academy projects, which prepare high school graduates who are not college bound for careers in the technology field

- Develop incentives to attract and retain highly educated workers, with particular emphasis on STEAM fields

- Promote work-based learning opportunities such as technical skills apprentice programs or post-secondary internship programs throughout the state

- Develop additional or new transdisciplinary academic programming to meet the needs of Mississippi industries

Potential Success Metrics

» Increase the number of STEAM-related workforce programs

» Increase the number of students participating in workforce development programs

STATE PRIORITY AREA 3

Foster Mississippi's knowledge-based economy through the support of innovation, entrepreneurship, and advancement of intellectual property.

Growing economies are increasingly based on knowledge and information. Knowledge, technology development, translational research, and the transfer of technology into business development are recognized as key drivers of productivity and economic growth. Central to Mississippi's efforts to grow and foster its knowledge-based economy will be the need to intentionally design and support networks and services that promote innovation and entrepreneurship.

Prosperous economies in the 21st century support innovative firms and entrepreneurs with a wide range of interconnected initiatives. These successful economies translate knowledge-based skills and brainpower into wealth by identifying and supporting high growth companies and accelerating the formation of startup companies. Collaborative partnerships between state agencies, higher education institutions, and private industry must support the development and growth of technology-based efforts and businesses.

Objective 3.1 Foster a state-wide innovation and entrepreneurial ecosystem

Potential Strategies

- Cultivate strong alliances between MRC institutions, development and technology business associations, regional economic development organizations, and Mississippi Development Authority's Office of Technology, Innovation & Entrepreneurship

- Create opportunities for cross-collaboration between MRC institutions that focus on developing and growing entrepreneurial and innovation training programs

- Develop mechanisms for collaboration and knowledge sharing among the technology entrepreneurship faculty and programs in Mississippi

- Develop strategic collaborative efforts amongst MRC institutions that target specific economic development opportunities

- Inventory the current and planned applied technology entrepreneurship curriculums

- Foster regional forums that engage industry stakeholders and policy makers that results in developing collaborative strategies aimed at improving Mississippi's business climate

- Develop and foster collaborative networks that connect rural entrepreneurs to others throughout the state

- Develop a state-wide emerging technology funding mechanism to allow for the advancement and commercialization of emerging technology and start-ups

- Support effective technology transfer and capital accessibility programs to help commercialize innovations and expand university-industry partnerships

- Encourage placemaking around innovation hubs to retain and attract talent

Potential Success Metrics

» Increase the amount of capital available for STEAM-related entrepreneurial efforts

» Increase the number of entrepreneurial training programs specifically focused on STEAM-related opportunities and emerging technologies

Objective 3.2 Promote the development of intellectual property and its commercialization by research universities

Potential Strategies

- Foster intellectual property development to commercialize innovations and expand university-industry partnerships

- Support the commercial viability of Mississippi's intellectual property by providing access to commercial validation activities, trainings, and funding

- Launch the SMART Business Accelerator Initiative to fund grants to support university research and the development of intellectual property

- Identify and engage more faculty for developing intellectual property, licenses, patents, and commercialization capacity

- Provide access to more qualified Technology Transfer Office personnel and resources

- Ensure that proper resources are provided to Office of Technology Management offices for facilities, personnel, and equipment

- Foster collaborative relationships between Innovate Mississippi, the state's research universities, Engineering Research and Development Centers, and other military-related entities to bring emerging and existing technology to commercialization

Potential Success Metrics

» Increase the amount of funding available for intellectual property development

» Increase the amount of quality intellectual property

Objective 3.3 Increase the number of STEAM-related entrepreneurs, business start-ups, and business expansions in Mississippi

Potential Strategies

- Promote scale-up opportunities for high-tech start-up companies

- Enhance business incubators affiliated with research universities

- Promote business education for students pursuing a degree in STEAM fields and provide opportunities for university and K-12 students to engage in entrepreneurship

- Identify strategic partnerships with Mississippi Development Authority's Office of Technology, Innovation & Entrepreneurship, who is currently assisting with the development of multiple angel funds and working to attract capital fund managers to the state

- Utilize Mississippi Development Authority's resources to accelerate the success of Mississippi's start up ecosystem

Potential Success Metrics

» Increase the number of STEAM-related startups

» Increase the number of STEAM-related business expansions

Objective 3.4 Align research strengths with state-wide targeted industry development efforts

Potential Strategies

- Capitalize on the science and technology expertise at Mississippi research institutions to develop industry growth opportunities with potential focus on areas of emerging technologies

- Establish a partnership between MRC institutions and the Mississippi Development Authority to further develop strategies to grow and recruit industries that leverage Mississippi's emerging technologies

- Support Research and Development that aligns with established and emerging technologies

- Establish high tech industry sectors in emerging areas

- Attract and support innovation-based industry

- Engage various groups that focus on advanced technology and emerging technology organizations through Mississippi Development Authority's Office of Technology, Innovation & Entrepreneurship

- Develop the Knowledge Intensive Pathway, which is a plan for knowledge-based economic development for the state

Potential Success Metrics

» Increase the number of new and expanded businesses within the targeted industry sectors

» Increase the number of industry and university R&D partnerships

Objective 3.5 Promote Mississippi's emerging technologies and research expertise

Potential Strategies

- Develop marketing and communication efforts that promote emerging technologies, complement research expertise, and showcase the collaborations of MRC institutions

- Conduct institution-specific assessments to identify and align needs with emerging priorities. Focus on core, multi-user equipment, technologies and materials with accessibility policies and procedures, as well as maintenance for quality assurance

- Promote innovative and entrepreneurial development with a key focus on emerging technologies and knowledge-based economic development

Potential Success Metrics

» Increase the amount of marketing expenditures related to emerging technologies and research expertise

» Increase the number of collaborative marketing efforts

Cluster Hiring: An emerging practice in higher education which involves the hiring of faculty into multiple departments or colleges around interdisciplinary research topics, or "clusters" (e.g., *Optoelectronics; Data Science and Health Informatics; Biomedical Engineering*).

Emerging Technologies: Refers to technologies that are being developed and expected to be available soon, which are creating, or are expected to create, significant social or economic effects. The specific emerging technologies identified as part of the S&T Plan include:

- *Advanced Materials*
- *Autonomy*
- *Agriculture*
- *Biomedical/Healthcare*
- *Data Science*
- *Logistics*
- *Sensors & Diagnostics*

Objectives: Are high level statements that outline, in more detail, what could be achieved within a particular priority area. Objectives can be tangibly achieved and contribute to achieving at least one of the State Priority Areas.

Placemaking: A collaborative approach to the planning, design, and management of public spaces. It capitalizes on a local communities' assets, inspiration, and potential with the intention of creating public spaces that promote health, well-being. Placemaking plays a critical role in fostering entrepreneurial ecosystems.

Repatriation: Refers to the return of individuals to Mississippi for the purpose of employment and/or residency.

State Priority Areas: Represent high-level, broad descriptors that serve as the foundation for strategic efforts. They create structure around how the State of Mississippi could begin to collaboratively diversify and strengthen its knowledge-based economy.

Strategies: Describe specific actions or efforts that could be completed to help begin accomplishing a particular objective. (*It should be noted that some of the potential strategies listed could help advance the state toward more than just one objective.*)

Success Metrics: Serve as potential guideposts for future efforts and could help provide feedback regarding progress toward an objective. These metrics could be used to determine if current efforts are in alignment with stated objectives and serve as markers to help determine if any adjustments or course corrections should be made.

Targeted Industries: Describes groupings of companies within a single given industry that play to a state or regions strengths. The specific targeted industries for industrial development in Mississippi as defined by the Mississippi Development Authority include:

- *Advanced manufacturing*
- *Aerospace*
- *Agribusiness*
- *Automotive*
- *Distribution & Warehousing*
- *Energy*
- *Healthcare*
- *Information Technology*
- *Shipbuilding*
- *Tourism & Film*

Team Science: Team Science is a collaborative effort to address a scientific challenge that leverages the strengths and expertise of professionals, oftentimes trained in different fields or disciplines. Team Science encourages intradisciplinary research.

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