

Across the Curriculum: The GIScience Development Strategy at K-State

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Abstract

Several strategic administrative decisions enabled a coordinated expansion of GIScience capabilities across the academic units at Kansas State University. Administrators and faculty recognize the importance of GIScience. At K-State, GIScience education has been described as “The Fourth R,” with spatial reasoning seen as “something that every educated person should know about.” We identify important administrative decisions and document the associated responses that have resulted in a greatly improved environment for GIScience teaching and research. Examples of strategic decisions include the development of an All-University GIScience Steering Committee, the establishment of a GIScience Commons, two Targeted Excellence proposals supporting IT infrastructure, research, and new GIScience positions within the institution. Continued connection with key state-wide GIScience decision makers and participation in related meetings has also been important. We conclude that collaborative and supportive interaction among faculty and administrators has been critical to the success of this effort.

Getting Started

At the turn of the Millennium, geographic information systems and remote sensing were in evidence across the many Colleges and academic departments at Kansas State University. The activities included major efforts related to extramural funding wherein GIS and remote sensing were important components of large multi-disciplinary and multi-year efforts. Two specialized research laboratories, the Remote Sensing Research Lab (RSRL) and the Geographic Information Systems and Spatial Analysis Laboratory (GISSAL), were housed in the Department of Geography in the College of Arts & Sciences. Instructional activity ranged from basic introductory classes offered as a part of the geography curriculum, through specialized classes in specific curricula (examples include Site-Specific Agriculture in Agronomy and Land Resource Information Systems in Landscape Architecture), to advanced seminars, and independent advising related to thesis or dissertation research.

With funding from three Colleges (Arts & Sciences, Engineering, and Architecture, Planning, & Design) and support from the Provost and the Vice Provost for Academic Services and Technology, an effort was begun to assess the status of GIS activities at Kansas State University and to compare local capability with efforts at peer institutions. Dr. Shawn Hutchinson was hired as a GIS Coordinator in August 2000 and completed an assessment during his first year on campus. An internal May 2001 K-State document, *The Vector*, provided an overview of the existing situation and suggestions regarding ways to move forward. Section headings from *The Vector* included:

- Geospatial Technology at Kansas State University
- GIS Coordinator Activities
- Employment Outlook and Student Preparation

- Student and Faculty Demand
- Issue #1: Hire Tenure-Track Faculty Specialists
- Issue #2: Curriculum Development
- Issue #3: Extension and Continuing Education
- Issue #4: Geospatial Technology Resource Center
- Issue #5: University ESRI Site License
- Faculty/Staff Interview Index
- What is GIScience
- Peer University Comparison: Spotlight on Oklahoma State University

In writing *The Vector*, Hutchinson not only identified the status of the current situation, but he also wrote the material in a style designed to appeal to K-State administrators; he identified existing strengths and presented areas of concern as challenges that could be addressed as K-State moved forward with GIScience. In retrospect, *The Vector* was a very thorough assessment and provided excellent information that helped guide a slow progression in GIScience activities during the next few years.

Targeted Excellence I – Geospatial Technology Infrastructure Enhancement Program

In the summer of 2004, Kansas State University Administrators identified a new program, Targeted Excellence, to help advance scholarship at the institution. Drs. Shawn Hutchinson and John Harrington, Jr. responded to the request for proposals with a proposed five year project; the Geospatial Technology Infrastructure Enhancement Program. The proposal, which brought together a total of 15 faculty and IT staff members, sought to greatly expand K-State’s capabilities in geospatial research, teaching, and service/outreach. Student underexposure to GIS and other geospatial technologies was related to an insufficient number of trained educators among the ranks of faculty, a shortage of relevant classes and continuing education opportunities, and suitable high-tech lab classroom facilities. The proposal addressed those shortfalls with the goals of facilitating the diffusion of GIScience and geospatial technologies into the general university community and promoting the informed and responsible use of GIScience and geographic analysis for the benefit of society.

Specific proposed enhancements to K-State geospatial capabilities included:

- New faculty members and a GIS Education and Outreach Coordinator to expand the geospatial technology curriculum via traditional courses, web-based modules, and workshops.
- A GIS Research Coordinator to provide training, data, and applications/technical assistance to the campus community and state.
- Additional central computing support staff to address core computing, networking, and technical support needs.
- Creation of a university geospatial technology teaching laboratory.
- Exposing a larger, and more diverse, population of students to geospatial technologies and the value of spatial analysis and reasoning.
- Increasing the spatial literacy of K-State students.
- Additional social science faculty and GIS experts that can participate in multidisciplinary teaching and research.
- Increased competitiveness for extramural research funding.

This comprehensive proposal addressed the need for growth or improved capability in a number of areas, including teaching, research, outreach, administration, and professional development. A Venn diagram (Figure 1) was assembled to help illustrate the overall vision for GIScience excellence at Kansas State.

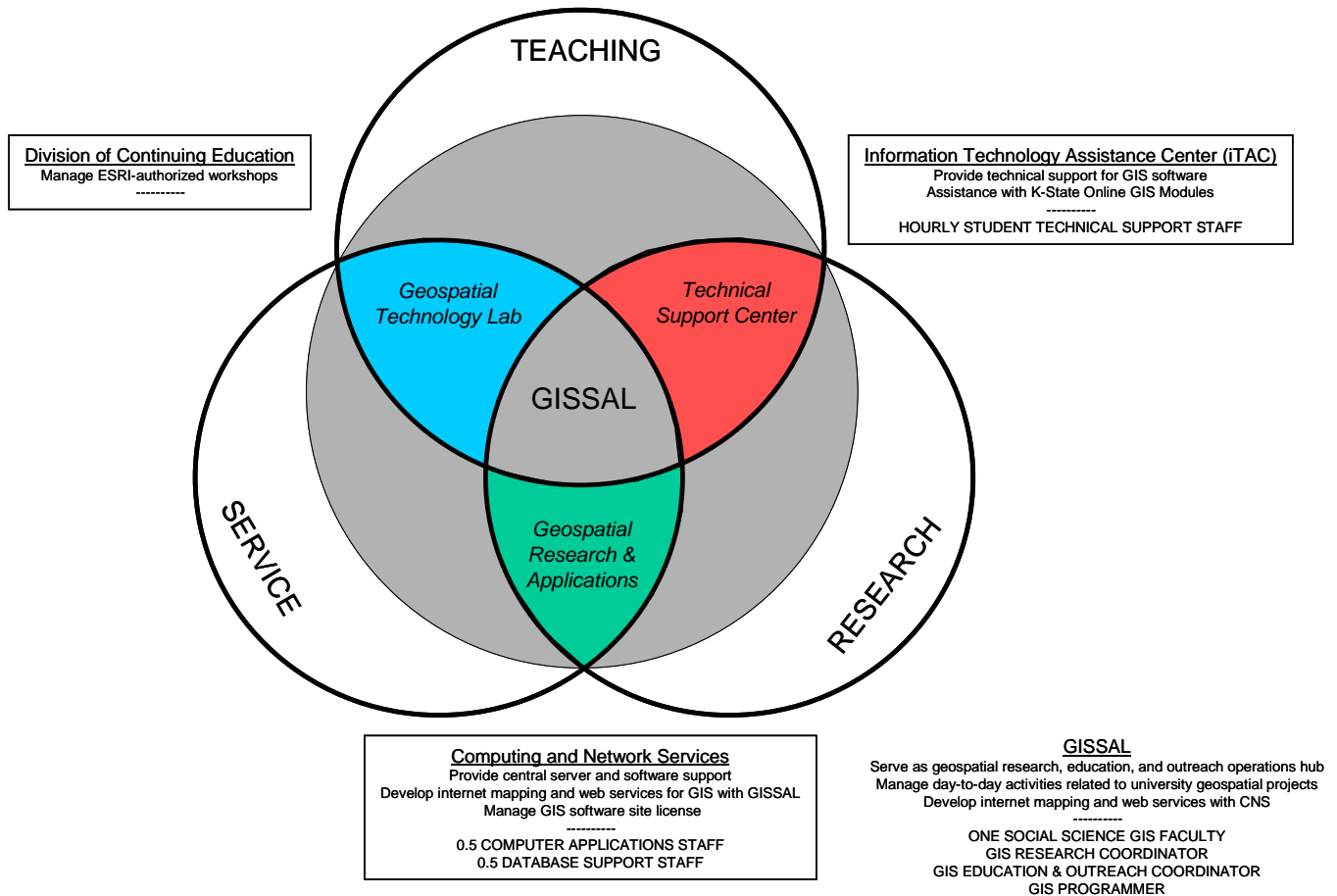


Figure 1. Conceptual design for integration/management of geospatial technology enhancements.

With only limited funding available and a number of excellent proposals from across the Kansas State University campus, the Provost decide to partially fund the activities identified in the Geospatial Technology Infrastructure Enhancement Program. A five year award of \$330,000 was made available with the major emphasis on providing the salary for a campus-wide GIS research coordinator. Feedback at the time of the Targeted Excellence award indicated that the committee that had advised the Provost on the various Targeted Excellence proposals and funding levels would look favorably on an additional proposal with an emphasis on research activities for the second year of the competition.

At least six very important developments occurred during the first year of Targeted Excellence activities: 1) the University moved quickly to become a member of the University Consortium for Geographic Information Science, 2) Mr. Rick Chubb was hired as a geodatabase support person and GIS application developer, 3) an Undergraduate Certificate in GIS was implemented, 4) a technology commons, then called the Geospatial Technology Commons, was conceptualized, 5) a GIScience lecture series was established and Dr. David Maidment presented the initial lecture, and 6) the Provost established an all-university committee to advise the administration of GIS.

The All-University GIScience Steering Committee

In the Fall Semester of 2004, the All-University GIScience Steering Committee was established with Dr. John Harrington as the Chair. K-State Provost M. Duane Nellis charged this committee to 1) help move GIS forward across the many academic and research units within the University and 2) to inform the campus administration of the status of that advancement and of issues that precluded further growth. Membership of the Steering Committee was designed to include representatives from all the colleges across the campus (from Business Administration to Human Ecology, Agriculture, Technology and Aviation, and Veterinary Medicine and including the more obvious Colleges of Engineering, Arts & Sciences, and Architecture, Planning, and Design). In addition, representatives from Kansas state government, the private sector, and from another Kansas institution of higher education helped add expertise to the Steering Committee. Since its inception, the Steering Committee has met approximately three times each semester so that the multidisciplinary group could share information.

Targeted Excellence II – Geospatial Technology Infrastructure Enhancement Program – Phase II

During the first year of Targeted Excellence activities, a second proposal which requested additional funding to support research infrastructure was submitted. The goal of this proposal was to establish a research Center of Excellence for Geospatial Technology and Applications and to continue the diffusion of GIScience and geospatial technologies throughout the general university community. Hutchinson (PI) and Harrington (Co-PI) were awarded \$550,000 over four years to 1) elevate Kansas State University to a leadership position in geospatial research for agricultural biosecurity (including food safety), biosciences, and environmental quality; and 2) help move K-State toward international recognition for cross-disciplinary application of geospatial technologies. A simplified conceptual diagram (Figure 2) was prepared to illustrate the vision for GIScience infrastructure across the campus. A significant portion of the funding for the Phase II effort was 'earmarked' for a new GIScience faculty line with the expectation that the person hired would assist with advancements in the areas of social science or business. Again, the team of co-investigators for this Targeted Excellence research effort included members from across the many different academic units at K-State.

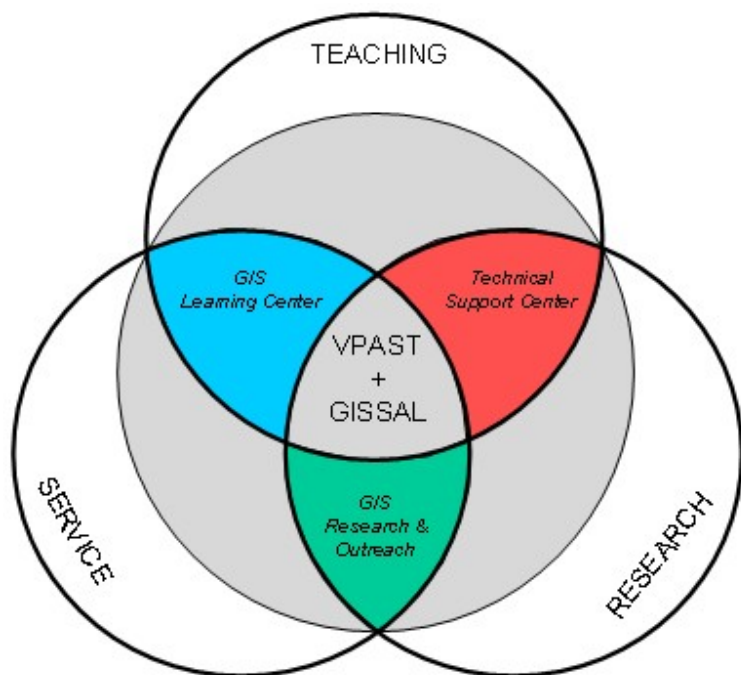


Figure 2. Conceptual design for Phase II integration and management of proposed geospatial technology enhancements at K-State.

During the first year of Phase II GIScience infrastructure development activities, a number of significant events helped move the overall effort forward. These events included: 1) the dedication of an All-University GIScience Commons in November, 2005, 2) the celebration of the 15th anniversary of GISSAL, 3) a meeting of the State of Kansas GIS Policy Board on the K-State Campus, and 4) the awarding of an ESRI Special Achievement in GIS (SAG) Award in Agriculture to Kansas State University. The dedication of an All-University GIScience Commons by Kansas State University Provost Nellis was a very special event. Former Wyoming Governor, K-State alumnus, and current ESRI consultant, Jim Geringer, attended and spoke at the dedication. At the time of the GIScience Commons dedication the ‘space’ was virtual, however plans were already being made for development of 1,800 sq ft of space (strategically located in a building that housed academic units from three different colleges) that had been allocated for the development of a physical commons portal (Figure 3). The proposed K-State GIScience Commons Portal is visualized as a showcase to facilitate and grow multidisciplinary GIScience understanding and leverage interdisciplinary competitive research and service awards to expert faculty who will train current, and future, leaders and policy makers in science-based decision making.



Figure 3. Physical location of the GIScience Commons Portal on the west side of Seaton Hall.

In an August 2006 GIScience ‘highlights’ report prepared for college Deans and the Provost, a number of items were identified: 1) the growth of the community of GIS scholars, 2) the national leadership provided by K-State in using GIS to address issues in agricultural security, 3) growth in extramural funding that included a significant GIScience component, 4) the addition of digital cartography and introductory GIS courses into the university general education curriculum, 5) the acquisition of state-of-the-art hardware for serving the GIScience community (including upgraded geovisualization capabilities), and 6) numerous synergistic activities across the campus. GIScience Commons expertise grew significantly with a decision by the U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) to locate a GIS Science Fellow at K-State, the addition of a GIS post-doc hired on an multi-year project funded by the U.S. Environmental Protection Agency (USEPA) Western

Ecology Lab, another post-doc funded on a large Kansas National Science Foundation (NSF) EPSCoR project in ecological forecasting, and the addition of a second database specialist, Mr. Shiva Mohandass, to serve the campus community. Initial funding of salary dollars for Mr. Mohandass came from the Kansas NSF EPSCoR ecological forecasting grant, but it is important to recognize that the community of K-State administrators recognized the value of adding expertise in the GIScience area and agreed to continue funding following the availability of grant dollars. The strategy of using grant dollars to supply initial funding for adding new expertise to the campus community with an institutional commitment to continue the position has been critical in recruiting top quality people to join the GIScience team at K-State.

Conceptual Development of the GIScience Commons

In order to design an appropriate physical facility for the GIScience Commons, a SWAT (Strategic Ways to Acquire Technology) team was assembled with Dr. Rebecca Gould (Information Technology Assistance Center), Dr. Shawn Hutchinson (Geography) and Mr. Eric Bernard (Landscape Architecture) serving as co-chairs. SWAT members, representing K-State colleges, information technology units and research teams currently using GIScience, developed guiding principles and requirements for the physical space and digital infrastructure. The space must:

- Host assemblages of collaborative and multidisciplinary learners and researchers focused on varying aspects of GIScience,
- Provide the latest hardware and software used in GIScience,
- Provide office space for the university’s dedicated GIScience staff,
- Provide workstation pods for research and learning activities,
- Contain a conference room to facilitate face-to-face and virtual meetings,
- Be climate controlled and secure (physically and digitally),
- Maintain the highest possible data access speed to K-State & outside computing resources, and
- Provide audio and video communications services that would enable participation in crisis planning and management, especially as related to agricultural biosecurity and natural hazards.

A draft diagram was assembled to illustrate one plan for how this facility might look (Figure 4).



Figure 4. GIScience Commons Portal floor plan.

Considerable Momentum, Adding New Faculty, a TAC, and a Visit by Jack Dangermond

Integration of GIScience across the K-State academic community was moving forward with considerable momentum during the 2006-07 academic year. As enterprise GIScience concepts advanced and the transition was made to geodatabase architecture and distributed web services, the All-University GIScience Steering Committee saw fit to add a Technology Advisory Committee (TAC). This group was organized with Mr. Rick Chubb as the chair. TAC expertise and advice has been critical since its formation in recommending and justifying new hardware acquisition and in making administrators aware of potential snags in having all the needed IT personnel available for hardware installation.

In response to another call for proposals for Targeted Excellence, the group assembled a third proposal for potential funding. The pre-proposal for Phase III activities was accepted by the review panel and a full-proposal that would help fund construction of the physical GIScience Commons Portal and address the areas of curriculum development and outreach was submitted during the spring semester 2007. However, the review panel that assessed the full proposals did not recommend funding given the lack of a direct research contribution evident in the proposal.

Given the volume and magnitude of on-going development in GIScience at K-State and the extent of the enterprise GIS developments for the Kansas NSF EPSCoR ecological forecasting grant, a decision was made by Mr. Jack Dangermond, the President of ESRI, to spend a full day learning more about the GIScience efforts at Kansas State University. During his visit to Manhattan, Dangermond presented a Provost Lecture, "GIS Vision and Enabling Technology," on Thursday March 8, 2007. Video of that lecture is available at: <http://www.k-state.edu/provost/academic/lecture/2006-7/dangermond.htm>

During the Spring Semester, 2007, a successful search identified Dr. Marcellus Caldas to join the Kansas State University faculty. Caldas is an internationally recognized scholar who uses both GIS and remote sensing to address social science issues related to deforestation, agricultural development, and related human settlement in the Amazon of Brazil. Dr. Caldas brings academic training in applied economics, spatial econometrics, and land change science to the K-State team of GIScience experts.

Strategic planning efforts in the Department of Marketing, within the College of Business Administration, identified information technology and specifically GIScience as areas for future growth. A major gift to the College by a K-State alumnus helped provide the funds for the Jack Vanier GIS Chair in Business Administration. As of June, 2008, a search was underway to select a new faculty member who will serve as a focal point for research and scholarly programs in business GIS. Faculty and administrative searches across other units at K-State during the 2007-08 academic year led to the hiring of a leading GIS and remote sensing expert in ecology, Dr. John Briggs, and another leading expert in remote sensing of rangeland ecosystems, Dr. Kevin Price.

Reorganization and Reinvigorating Collaborative GIScience Efforts

A number of additional relevant events related to moving the GIScience effort across the curriculum at K-State happened during the 2007-08 academic year. Forward momentum regarding GIScience development slowed a bit with the phased retirement and sabbatical of Dr. Elizabeth Unger. Along with

Provost and Senior Vice President Dr. Nellis, Beth Unger had been a guiding force in recognizing the need for GIScience advancement and using resources available to her to move the effort forward. In addition and in consultation with Dr. Nellis, John Harrington stepped aside as Chair of the All-University GIScience Steering Committee. Harrington had new opportunities involving research in coupling natural and human systems and administration of K-12 geographic education efforts in Kansas. The synergy of these events led Provost Nellis to meet with and reinvigorate a reorganized All-University GIScience Steering Committee under the leadership of Mr. Eric Bernard, a faculty member in Landscape Architecture. The 2007-08 academic year also saw the start of a local ESRI Users Group that now meets on a monthly basis, as well as the installation of additional new hardware.

Acknowledgement

The advancement of GIScience across the multiple units at Kansas State University could not have happened without significant intellectual and financial support. A few individuals deserve recognition in this regard. Ed Crane, our regional ESRI representative, has been a constant source of high quality information and inspiration. Deans Steve White (College of Arts & Sciences), Dennis Law (College of Architecture, Planning, and Design), and Terry King (former Dean of the College of Engineering) used resources available to them to help guide the GIScience advancement process. Former Vice-Provost for Academic Services and Technology, Dr. Elizabeth Unger, provided a vision for a vastly improved GIScience research and teaching environment, with her belief that all students at Kansas State University should be exposed to GIS and spatial reasoning during their undergraduate education. Finally, and perhaps most importantly, has been the vision, intellectual support, and funding made available by former Provost Dr. Jim Coffman and the current K-State Provost and Senior Vice President, Dr. M. Duane Nellis.

Manuscript prepared in June, 2008, by Drs. John Harrington, Jr. and Shawn Hutchinson for presentation on Wednesday, August 6th at the 2008 ESRI International Users Conference in a session on Promoting Collaboration in the Academic Community with GIS.