

## Big Data and the Emerging Data Sciences

Idaho is leading the region in applying data to complex issues. Anticipating the increasing ease of data collection and its potential for impact on businesses, agencies and educational institutions, the University of Idaho has led the build-out of data management infrastructure to support data management research and education across the state and in the Northwest.

### Capitalizing on the data deluge

Accessing and applying data effectively can improve the performance and competitive advantage of Idaho's industries, agencies and educational system. However, this data-rich world has challenges. The amount of data available to support decision and policy making, advance the practice of science, and manage and enhance the educational process is increasing exponentially.



Determining data's value and accurate history, combining data of different types and sources, gleaning from it useful information, and applying it to decision and policy making requires technical skill, new hardware and software, and leadership capacity – all tailored to the new era of big data and data sciences.

Idaho's research and education infrastructure can make direct contributions to the performance of Idaho's industries, agencies and organizations. Research and education can increase the security, efficient storage, accessibility, documentation and processing power of data, develop new tools and models for information display and interpretation, prepare the workforce to measure and manage more precisely than ever before, and teach leadership skills for the application of new levels of information and knowledge to decision and policy making.

### Idaho leadership

The university launched the Northwest Knowledge Network (NKN) in 2010, a data-management infrastructure that provides data services to researchers, structures cooperation and collaboration among institutions who manage and use data across the state and region, and prioritizes research topics to keep our region and institutions on the cutting edge of data science and application.

Idaho National Laboratory has provided full hardware and software back up for the NKN data management effort. The Idaho Regional Optical Network (IRON) is partnering with NKN on the development of the fiber network for movement of data across the state and onto large regional and national fiber networks. Idaho National Science Foundation EPSCoR has developed a data-management memorandum between Idaho's three research universities, and the universities have just approved a

strategic plan that will guide priority-setting and coordination of big data and cyberinfrastructure proposals across the state's higher education network.

## **Investing in the future**

Data management is a rich environment with promise for return on investment – rich in discovery, application, collaboration and partnership. Strategic, continual investments in data research and education will return direct benefits in competitiveness and performance to the citizens, businesses and students of our state and region.

Further investments in the following areas will build upon the leadership already demonstrated by the University of Idaho and its partners:

- **Culturing leadership:** Leadership development for the big-data era can be built into educational programs for business, agency and government leaders. Big data managed well allows leaders to make better predictions and smarter decisions, and to target their actions more precisely.
- **Increasing research competitiveness through campus and statewide cyberinfrastructure:** Research and education faculty with access to big data, tools and information products; new capacity to integrate data across type, time and space; and a statewide network for sharing of data and hardware resources will be more competitive for grants and quickly provide managers with tools and models.
- **Expanding public access:** A well-developed process of research data management will lead to dramatic increases in public access, making data more accessible to private entrepreneurs. Investment in data storage, metadata management and security ensures that original research products, funded by public dollars, are protected and available for reuse by everyone.
- **Ensuring data security:** There is a need to secure all types of data. Of special interest to researchers and educators are the many types of social science data generated in research work with communities.
- **Visualization, virtualization technology:** Decision makers, policy makers and students can be supported in new ways by technologies that allow them to see the potential impacts of different decisions and scenarios. The University of Idaho is using virtual technologies to conduct interdisciplinary research in biology, engineering, education, history, psychology and theater, and to elucidate fundamentals of science, technology and math in STEM education programs. Augmented reality and computer vision are the fastest emerging markets in the visualization of data and information and will require nimble public-private partnerships.
- **Interoperability:** The university and EPSCoR (through its pending Track 1 proposal) are focusing on making data interoperable across data types, disciplines, and spatial and time scales.

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