

**Woods Hole Oceanographic Institution
Review of Information Technology (IT) Functions
Panel: Visiting Committee and Internal Members

Final Report**

Review conducted the week of May 5th – May 13th 2014

Conducted by:

Panel Members

- Stephen Lorch, External Consultant & Panel Chair
- Mark Nye, External Consultant
- Elaine Bolognese, WHOI Senior Financial Analyst
- Matthew A. Charette, Senior WHOI Scientist
- Joe Futrelle, WHOI Information Systems Associate
- Steven R. Jayne, Senior WHOI Scientist
- Arthur Newhall, Senior WHOI Information Systems Specialist
- Hanumant Singh, Associate WHOI Scientist

Independent Reviewers

- Dr. Rosio Alvarez, CIO, Lawrence Berkeley National Laboratory
- Sean Lee, CIO, Coatue Capital LLC (Representing Trustee David Scully)

Final Report dated June 16, 2014

WHOI Executive Summary of IT Panel Recommendations

As of January 1, 2014 the oversight management of Computer Information Services (CIS) was transferred from the office of the Director of Research to the office of the Chief Financial Officer. Management Information Services (MIS) already was under the Chief Financial Officer. As a result a study was launched to:

- Assess the current state of information services at WHOI,
- Understand the activities of each group,
- Determine how well these services are meeting the needs of WHOI,
- Recommend actions to improve the level of service,
- Provide guidance for future development

Toward these ends a consultant was retained to conduct interviews with the staff of each group, and a broad section of users of each service. As a consequence of these interviews an IT review panel of outside experts and WHOI staff (Appendix A) was convened with a specific charge to evaluate the Institutions IT services on a number of key dimensions (Appendix B). (Panel members met with the Shipboard Scientific Services Group (SSSG) but their IT operations are not part of this review)

This summary and the accompanying PowerPoint slides present the preliminary observations, findings and recommendations of the panel.

Observations

IT Systems at WHOI are in a fragile state. Funding challenges combined with inadequate management of IT resources causes WHOI to incur substantial real and potential costs by:

- Compromising the security of its systems and its data
- Exposing and heightening WHOI's vulnerability to system failures
- Undermining the effective financial management of grants and contracts
- Jeopardizing the ability of data-dependent projects to deliver their services
- Maintaining multiple shadow systems (Excel Spreadsheets) to verify administrative data
- Lacking timely information for making and supporting management decisions
- Maintaining duplicative data sets and performing repetitive data entry
- Fragmenting and duplicating support services
- An inability to recruit and retain IT personnel

Recommendations

The specific recommendations of the IT Panel, made with the approval of the outside reviewers, are summarized on the attached PowerPoint slides. Our major focus was on areas that are easy to fix, cause the institution to be vulnerable to major disruption, comprise its security, or generate a remarkable amount of duplicative effort. The panel's major recommendations include:

- Reduce Institutional Vulnerability by:
 - Performing a High-Level Disaster Recovery and Business Continuity Audit
 - Stabilizing IT Funding
 - Documenting Procedures for Disaster Recovery
 - Documenting all In-House Developed Software
 - Creating an Institutional IT Knowledge Base
- Independently Monitor IT Security
 - Form an IT Security and Compliance Office reporting to the Directorate
- Hire an IT Director to oversee all of IT by:
 - Consolidating CIS and MIS
 - Unifying IT Support Services (Desktop, Web, Infrastructure, Data...)
 - Creating Directories of IT Capabilities
 - Creating a 3-5 Year IT Strategic Plan / IT Budget
 - Building an IT Staff Hiring and Retention Program
- Reinstitute IT Staff Training / Support
- Perform an IT staff skills assessment to determine workforce strengths/gaps
- Support all Desktop Hardware Platforms Including Macintosh
- Consolidate Redundant Systems (System Directories, Email, Calendar...)
- Where possible, integrate research projects and their islands of IT resources with official programs and provide incentives for individuals or groups who provide added IT value to the entire organization
- Explore the Virtualization and Collocation of Servers to make more efficient use of WHOI hardware resources, lower costs, and improve service availability
- Accelerate Paperless Workflow (Travel, Proposals, Gifts, Property...)
- Explore the long term feasibility of a fully integrated business data warehouse

When considering an implementation timeline, we believe that WHOI should immediately:

- Initiate a search for and hire an IT Director. (Estimated Time – 6 months)
- Address the vulnerabilities to institutional security and business continuity

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- Attend to easy fixes – *e.g.* restoring Macintosh desktop support and reinstating IT staff training budgets
- Establish a panel (including members of SACC and ITAC) to evaluate the adequacy of the current IT funding levels and provide ongoing financial and operational oversight of WHOI IT

We trust that quick consequential action will build a base of organizational support for more significant change. Once the IT Director is in place the focus can shift to reorganizing the existing IT resources and achieving efficiency and cost-savings through the consolidation of redundant systems and services. Long-term systemic fixes, such as a wholly integrated business data warehouse or business intelligence (BI) system may also be considered, but should be deferred until the management of IT services is strengthened, and the integrity of the feeder systems verified.

Recommended next steps for the review process

- Comparable Institutional Analysis
- Structuring of IT Governance and Accountability
- Implementation Planning

Notes on WHOI IT

As a world-class research Institution WHOI, like its academic counterparts, views itself as having unique characteristics and needs. Historically this view has carried over to IT resulting in the development of custom tailored systems. CIS has been the dominant provider by designing and maintaining tailored software and hardware—primarily based on open source software—to the community. It has also been a vendor of fee-based IT consultation. MIS has provided more traditional off the shelf solutions and is entirely funded out of overhead. Over the years the reliance on both services has changed dramatically as IT has become an increasingly mission critical component of both WHOI's scientific and administrative activities. The most recent review of IT (CIS) conducted in 2008 (Curry Report) clearly recognized the importance of this transformation and made specific recommendations that have received little or no attention. In the intervening six years the investment in the WHOI IT environment has steadily declined while IT capabilities and services throughout society have literally exploded.

A partial explanation of this divergence can be found in the “soft-money” environment at WHOI. The need to minimize overhead creates a constant vigil to keep indirect costs as low as possible. The result is that WHOI IT significantly suffers by being primarily viewed as a cost, not as a necessity that requires constant investment and maintenance. The lack of transparency of CIS funding further

exacerbates the problem; as does the absence of an Institution wide IT plan/budget that explicitly identifies WHOI's current and future IT needs.

The effect of this historical lack of IT managerial discipline goes far beyond IT. These observations are well understood and do not come as a surprise to anyone familiar with WHOI's IT environment, including the staffs at MIS and CIS. WHOI has been fortunate to benefit from the individual can-do attitude of the current CIS and MIS professionals in maintaining its systems and providing staff support up to the limits of their capabilities. It is to their credit that system wide failures have been minimized. The continuation of relying on individuals to carry the Institution's IT systemic knowledge in their head is not sustainable.

A short note on the utilization of open-source programming at WHOI is indicated. Over the years CIS has acted as a resource and as a development shop for IT capabilities needed by the Institution and individual projects. Many of these needs have been met by not acquiring commercial products, but by acquiring open-source solutions that have carried little or no initial cost. This practice is the cause of some of the underlying difficulties with WHOI IT. Committing to an open-source solution carries with it a commitment to detailed documentation and to providing on-going maintenance and support. The under funding of CIS and the subsequent reduction of the CIS workforce puts these programs and their users at risk since many are not well documented and the individuals who have been supporting these applications have retired or have left WHOI.

It will take a concerted effort over a considerable period of time to remediate these conditions. Previous reports have flagged many of these concerns without effect. Rather than dwell on the lack of attention paid to these issues in the past, the panel felt that a highly pragmatic approach was indicated. We concentrated our efforts on identifying problems that would affect the greatest number of people and could easily and inexpensively be remedied. Although there are real concerns about the long-term vulnerability and fragmentation of current systems, demonstrating that real changes are possible is paramount. The expert knowledge of the existing staff is critical in assuring the success of any of the proposed transitions. The larger infrastructure fixes will require detailed analysis and commitment of managerial time and financial resources that we felt the Institution is not realistically ready to undertake. The lack of adequate bandwidth availability on the Cape, the ever increasing capabilities of IT vendors, and the rapid development of the Cloud provide such a dynamic environment that any decisions proffered now, if not immediately implemented, would be obsolete.

Scientific Computing

The focus of the IT panel was on administrative computing. Although we were not charged with looking at the scientific computing at WHOI, it deserves mention. One of the major issues affecting WHOI scientists is the ever-growing deluge of digital oceanographic data and related bandwidth and storage needs. It seems clear that this “big data problem” is too large to be adequately addressed by individual researchers, and solutions need to be investigated at the organization level. This work will most likely involve WHOI networking upgrades along with the deployment of both on-campus and cloud-hosted storage resources.

A second significant concern is the gravitation of expert programming capabilities from being housed in CIS to being hosted in individual projects. There are now many centers of excellence in IT processing within WHOI. Many of these individuals are known to each other but are not very visible to the Institution as a whole. As a result transferable skills and capabilities are often not recognized. Nor is the concentration of IT talent seen as an asset to be exploited by the Institution. One of our recommendations is to generate a directory of these talents so that their capabilities are better understood and can more effectively be utilized. It would also be valuable to provide a forum and/or virtual organizational home to foster their capability within the WHOI community, to explore the possibility of collocating and/or sharing resources, and to offer more targeted professional development of WHOI’s scientific IT talent.

Appendix A

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- Stephen Lorch, External Consultant & Panel Chair
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Appendix B

Panel Charge

- Gain a detailed understanding of the health of WHOI IT operations.
- Compare WHOI IT operations with standards of practice existing within the information technology industry.
- Prioritize remediation efforts (if any) for MIS / CIS.
- Propose improvements to MIS / CIS operations.
- Recommend Management and Organizational changes.
- Realize cost savings and other efficiencies.