

NOAA INTEGRATED OCEAN OBSERVING SYSTEM

BUSINESS MODEL FOR DEVELOPING REGIONAL IOOS CAPABILITY

REPORT NOA72T2

Thomas D. Crowley

Tanya D. Corrie

Sangeeta Desai

Daniel C. Swift



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NOAA Integrated Ocean Observing System: Business Model for Developing Regional IOOS Capability

REPORT NOA72T2/APRIL 2008

Executive Summary

In October 2007, the NOAA Integrated Ocean Observing System (IOOS) Program asked LMI to develop a business model and funding approach that would enable NOAA to meet its goal for IOOS: develop and sustain a national network of regional observing systems that will meet both national and local needs for ocean information. LMI assessed the current business model against this desired outcome.

The NOAA-Region IOOS business model consists of five high-level components—strategy, organizational structures, IOOS requirements and implementation plans, funding, and communications—that drive an investment process that should lead to desired outcomes. The investment process consists of four phases: plan, select, control, and evaluate. The investment process, in turn, must be supported by an investment funding mechanism.

LMI developed findings and recommendations based on these business model components, reviews of documents and best practices, and interviews with NOAA, other federal IOOS partners, and regional IOOS partners. The recommendations associated with the most important issues are as follows:

- ◆ Improve coordination between the NOAA IOOS Program and the inter-agency planning office (Ocean.US) to reduce confusion created by IOOS strategy and guidance being issued by more than one source.
- ◆ Develop an IOOS implementation plan to guide regional IOOS development, particularly in support of the national IOOS. A detailed implementation plan that identifies what specific activities are to be accomplished and who is responsible for accomplishing them is a crucial tool for realizing the guidance in the IOOS strategic plan.
- ◆ Improve planning in the investment process to properly shape the scope of federal funding opportunities, as well as technical evaluations and selection criteria.

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- ◆ Establish a comprehensive communication plan that assists with maintaining the alignment of all aspects of the business model components, the investment process, and partner activities.
 - ◆ Establish a performance-based reporting process that supports the control and evaluation phases of the investment process and provides the foundation for supporting funding requests in the NOAA planning, programming, budgeting, and execution process.

LMI also identified key implementation activities that will put the NOAA IOOS Program on the path toward developing and sustaining a national network of regional observing systems. In addition, these activities will allow the NOAA IOOS Program to better understand the impacts of the recommended business model changes.

As far as the funding mechanism is concerned, LMI recommends that the NOAA IOOS Program continue using competitive, performance-based cooperative agreements to fund the regional IOOS programs. We believe that in the context of the NOAA IOOS business environment, cooperative agreements are sufficiently flexible to support the research performed by the regions and can provide the structure required to support operational development and achieve both national and regional end-user needs consistent with cost, risk, and implementation considerations. However, to ensure achievement of these outcomes, the NOAA IOOS Program must tailor the scope, technical evaluation and selection criteria, and performance management aspects of the cooperative agreement process. More important, the NOAA IOOS Program must justify requirements for sufficient funding to support both development activities in all regions and sustainment of existing capability. Until the program, with the help of its regional IOOS partners, can develop a performance-based case for the value delivered by regional IOOS investment, it may be challenged in obtaining the required level of funding.

The recommendations and associated implementation activities provide the basis for a strawman business model, identifying the most significant activities that can be used as the starting point for developing a full implementation plan. Implementation of the recommendations of this study should enhance the ability of the NOAA IOOS Program to develop and sustain a national network of regional observing systems that will meet both national and local needs for ocean information.

Contents

- Chapter 1 Introduction..... 1-1
 - BACKGROUND 1-2
 - STUDY APPROACH 1-4
 - REPORT ORGANIZATION..... 1-5
- Chapter 2 Overview of Business Model Framework2-1
- Chapter 3 Current NOAA-Regional IOOS Environment.....3-1
 - STRATEGY 3-3
 - Discussion 3-3
 - Key Findings..... 3-5
 - ORGANIZATIONAL STRUCTURE 3-5
 - Discussion 3-5
 - Key Findings..... 3-8
 - IOOS REQUIREMENTS AND IMPLEMENTATION PLANS 3-10
 - Discussion 3-10
 - Key Findings..... 3-10
 - FUNDING 3-11
 - Discussion 3-11
 - Key Findings..... 3-12
 - COMMUNICATION..... 3-13
 - Discussion 3-13
 - Key Findings..... 3-13
 - INVESTMENT PROCESSES 3-14
 - Plan 3-15
 - Select 3-18
 - Control..... 3-22
 - Evaluate 3-24
 - INVESTMENT FUNDING MECHANISM..... 3-25
 - Discussion 3-25

Key Finding.....	3-26
SUMMARY.....	3-28
Chapter 4 Recommendations	4-1
SELECTION CRITERIA.....	4-1
Goals and Objectives	4-2
Implementation Considerations	4-4
OMB Standards and GAO Best Practices	4-4
HIGH-LEVEL BUSINESS MODEL COMPONENTS	4-4
Strategy	4-5
IOOS Organizational Structure	4-5
Requirements and Implementation Plans.....	4-9
Funding	4-11
Communication.....	4-13
INVESTMENT PROCESSES	4-13
Plan Phase	4-14
Select Phase	4-15
Control Phase.....	4-16
Evaluate Phase	4-17
INVESTMENT FUNDING MECHANISM.....	4-18
SUMMARY	4-20
Chapter 5 Strawman Business Model: The Way Ahead	5-1
HIGH-LEVEL BUSINESS MODEL COMPONENTS	5-2
INVESTMENT PROCESSES	5-6
INVESTMENT FUNDING MECHANISM.....	5-8
SUMMARY	5-9
Appendix A List of Interviewees	
Appendix B List of Documents Reviewed	
Appendix C Cooperative Agreement Process	

Figures

Figure 1-1. IOOS Stakeholders..... 1-3

Figure 1-2. Study Approach 1-5

Figure 2-1. Sample Business Model 2-1

Figure 3-1. IOOS Development Landscape 3-2

Figure 3-2. Current NOAA-Regional Business Model 3-3

Figure 3-3. NOAA IOOS Program Office Organizational Structure 3-6

Figure 3-4. Notional RA Organizational Structure 3-7

Figure 3-5. Fundamental Phases of the Investment Management Approach 3-14

Figure 3-6. Regional Proposal Process 3-16

Figure 3-7. Total and Average Funding Requested and Awarded 3-20

Figure 3-8. Mapping of Proposed Funding to Work Functions 3-25

Figure 3-9. Impact of the Current Business Model..... 3-29

Figure 5-1. The Recommended Regional Business Model..... 5-1

Tables

Table 3-1. Issues with Cooperative Agreement Process 3-21

Table 3-2. Potential Strategies for Achieving Program Outcomes 3-27

Table 4-1. Selected NOAA IOOS Strategic Plan Elements Mapped to
Business Model Components 4-2

Table 4-2. Selected RA Goals, Objectives, and Expectations Mapped to
Business Model Components 4-3

Table 5-1. Key Implementation Activities: High-Level Business Model
Components 5-4

Table 5-2. Key Implementation Activities: Investment Processes 5-7

Chapter 1

Introduction

As a nation, we have benefited enormously from our oceans, coasts, and Great Lakes. More than half of the U.S. population—141 million people—lives within 50 miles of a coast, more than 2 million people depend directly on the ocean for employment, and coastal states produce 75 percent of this nation’s gross state product (GSP).¹ The rapid growth in the number of people living in immediate proximity to the ocean is placing conflicting demands on coastal ecosystems, threatening their integrity and capacity to provide goods and services. This demographic trend is also placing an increasingly large segment of our society at risk to natural hazards. This risk creates an immediate need for an integrated ocean observing system that will make more effective use of data resources to help predict these natural hazards.

The NOAA Integrated Ocean Observing System (IOOS) Program is leading efforts to design, operate, and improve the national and coastal network of ocean observations, in partnership with 17 federal agencies, 11 Regional Associations (RAs), and many NOAA offices and programs. RAs maintain and manage observing systems, called Regional Coastal Ocean Observing Systems (RCOOSs), to help address national and regional priorities.

IOOS is being developed using a distributed implementation approach that engages a broad range of stakeholders and helps to ensure that IOOS responds to end-user needs. The implementation is distributed in that the NOAA IOOS Program is responsible for identifying, sponsoring, and coordinating IOOS development efforts. Other NOAA programs or offices and other federal and non-federal partners, including the RAs, are responsible for developing and operating models, decision support tools, data management components, and most observation systems. This implementation approach makes it possible to take advantage of existing technical capabilities and capacity, rather than duplicate them, and to view IOOS more objectively, without being constrained by programmatic ties to existing structures, systems, or approaches.

The distributed implementation approach requires considerable interaction between the NOAA IOOS Program and its partner organizations. To be effective, this interaction must be grounded by a business model that includes a well-defined strategy, a fully established organizational structure, defined IOOS requirements and an implementation plan, communication that facilitates interaction and understanding between NOAA and its partner organizations, established investment processes that include performance measurement, consistent funding,

¹ NOAA, *Economic Statistics for NOAA*, National Ocean Economics Project, www.oceaneconomics.org, accessed January 25, 2006.

and the use of funding mechanisms that promote accountability and, where appropriate, competition. NOAA, assisted by LMI, is working with the regions to develop a new NOAA-Regional business model to support the long-term development and operation of regional IOOS capabilities that are integrated with the national IOOS.

BACKGROUND

The U.S. Commission on Ocean Policy called for the implementation of an integrated ocean observing system to increase our knowledge of the ocean.² In response to the commission, the Bush Administration called for the integration of U.S. ocean observations into the Global Earth Observation System of Systems (GEOSS).³ The first IOOS development plan,⁴ published by Ocean.US and approved by the Interagency Committee on Ocean Science and Resource Management Integration, addresses many of the commission's and Bush Administration's recommendations, including those for establishing an IOOS with an emphasis on regional development, developing the capacity for ecosystem-based management, and linking IOOS data and information to applications.

Development of IOOS is dependent upon the partnership of U.S. government agencies (federal and state), private enterprise, academia, and nongovernmental organizations (NGOs). In April 2006, the Joint Subcommittee on Ocean Science and Technology (JSOST) established the Interagency Working Group on Ocean Observations (IWGOO) to advise and assist the JSOST on matters related to ocean observations. IWGOO membership includes 15 federal agencies involved in ocean science and policy. NOAA chairs the IWGOO, while the Office of Naval Research (ONR), National Science Foundation (NSF), and NASA are vice-chairs.

The IWGOO charter established NOAA as the lead federal agency for implementing IOOS. A key function of the IWGOO is to integrate U.S. ocean observing efforts, including the IOOS, into the GEOSS. The IWGOO also is responsible for overseeing Ocean.US, the National Office for Integrated and Sustained Ocean Observations, which was established in 2000 by the congressionally created National Oceanographic Partnership Program (NOPP). Ocean.US has served as a planning office for the coordinated development of IOOS. Most of its planning efforts have been conducted at the strategic level, not at the implementation level with the detail required for investment planning.

The National Federation of Regional Associations (NFRA) and individual RAs are key NGOs involved with the development of IOOS. NFRA is a nonprofit or-

² U.S. Commission on Ocean Policy, *An Ocean Blueprint for the 21st Century*, 2004.

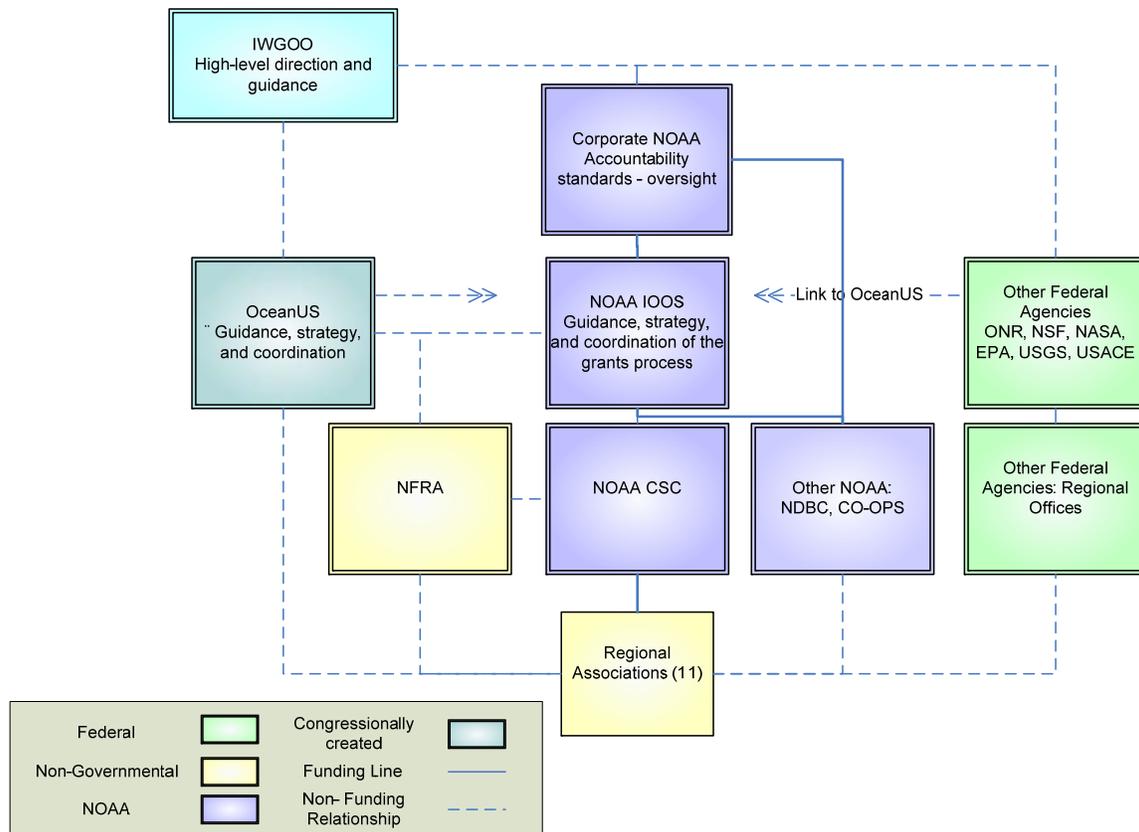
³ Council on Environmental Quality, *U.S. Ocean Action Plan: The Bush Administration's Response to the U.S. Commission on Ocean Policy*, December 17, 2007.

⁴ National Office for Integrated and Sustained Ocean Observations, *First Annual Integrated Ocean Observing System (IOOS) Development Plan*, Ocean.US Publication 9, January 2005, pp. 20–24.

ganization founded by the RAs at the recommendation of Ocean.US. NFRA's three core functions are to represent RAs at the federal level; coordinate RA activities; and build capacity through training, research, and technology transfer.

Figure 1-1 depicts the partnerships and the stakeholders in regional IOOS development.

Figure 1-1. IOOS Stakeholders⁵



The NOAA IOOS Program was established in February 2007. Before 2007, RCOOS development efforts were congressionally directed. RCOOSs provided, and continue to provide, valuable localized observation capability. However, there was no national framework or overarching federal program; therefore, there was no consistent method to select regional development efforts or to sustain operational activity over time. With limited guidance and an inconsistent funding profile, the regions focused on local priorities with limited formal linkage to end-user needs.

⁵ CSC is currently reviewing its role in the regional IOOS business model. The diagram depicts the organizational relationships of stakeholders at the time of the study: October 2007- February, 2008.

The NOAA IOOS Program provides a national framework, with the direction and structure necessary to integrate existing capabilities, develop IOOS components, and coordinate RA and RCOOS regional activities in support of the development of the regional component of IOOS.⁶ Regional coordination is facilitated through the use of merit-based cooperative agreements. The merit-based award process helps to ensure that regional development efforts align with NOAA IOOS requirements. Support for the award process is provided by the Coastal Services Center (CSC). CSC's role is to assist the NOAA IOOS Program with managing and coordinating NOAA's annual regional funding and project selection processes. CSC works directly with the NOAA IOOS Program to provide guidance on the cooperative agreements process, support development of announcements of federal funding opportunities (FFOs), review regional submissions, and assist with selection of reward recipients.

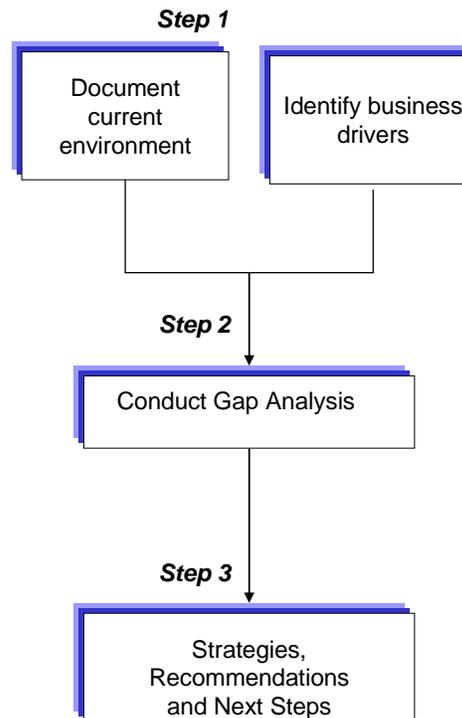
STUDY APPROACH

A wide variety of business models are in use by different organizations, including those in both the public and private sectors. Each organization conceptualizes its own business model based on the structures, processes, systems, and capabilities that the enterprise uses to create value.

To identify how best to structure the new NOAA-Regional business model, it was important to understand the existing business model, including how it works and what problem areas will need to be addressed by the new business model. Therefore, LMI conducted a gap analysis. This approach documents the current elements of an existing organizational structure and the processes used to support it, identifies the issues that are affecting the outcomes of the identified processes, and identifies changes to the existing structure or processes required to support achievement of the desired outcomes. Figure 1-2 illustrates the steps that were used to complete NOAA IOOS–Region business model analysis.

⁶ *NOAA Integrated Ocean Observing System (IOOS) Program: Strategic Plan, 2008–2014*, published in October 2007, outlines an implementation approach for development of IOOS, including related regional activities.

Figure 1-2. Study Approach



To collect the information required to complete this analysis, LMI interviewed IOOS stakeholders to better understand both NOAA and regional perspectives on how well the current business model functions. Appendix A lists the names and organizational associations of the people we interviewed. We also analyzed NOAA and regional information captured from NOAA strategic guidance, IOOS strategic guidance, regional business plans, regional cooperative agreement proposals, and conceptual design documents. Appendix B lists the materials reviewed for this study.

REPORT ORGANIZATION

This report is organized as follows:

- ◆ Chapter 2 describes the business model framework used to analyze the current NOAA-Regional environment.
- ◆ Chapter 3 describes the current NOAA-Regional environment; the NOAA-Regional business model, including the NOAA and regional organizational structures and the processes that support them; and the challenges created by continued use of the current business model.
- ◆ Chapter 4 outlines recommendations for a new NOAA-Regional business model, including benefits, challenges, and impacts on stakeholders, clients, and partners for each option.

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- ◆ Chapter 5 presents a strawman business model—the way ahead for improving regional IOOS development. In particular, it identifies key implementation activities associated with the recommendations in Chapter 4.

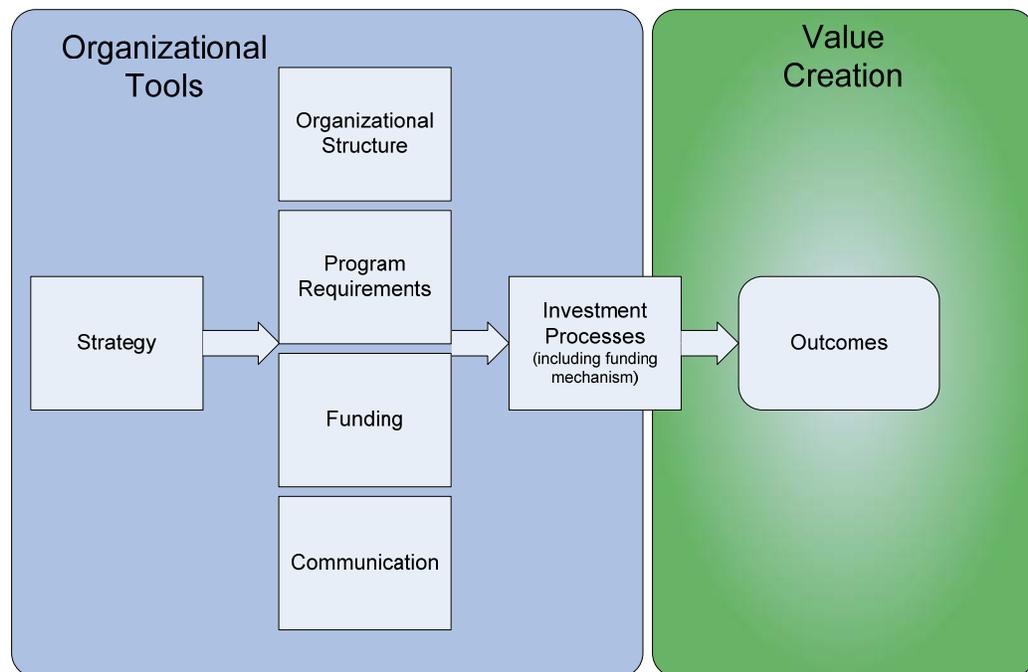
The appendixes contain additional detail.

Chapter 2

Overview of Business Model Framework

A business model is the set of strategic, organizational, and operational mechanisms that an entity uses to achieve its desired end state. These mechanisms can take the form of strategic and communications plans, organizational structures, technical development methods, partnership agreements, and many others. The primary purposes of a business model are to enable an entity to make use of its core capabilities by identifying the mechanisms that best fit that organization and support the achievement of the desired outcomes. Figure 2-1 illustrates a sample business model. There is no right or wrong business model; however, a business model that is aligned with an organization's capabilities, needs, and goals can better support the advancement toward the desired end state.

Figure 2-1. Sample Business Model



In this report, we use the business model framework to analyze how well the current NOAA-Regional business model supports the activities that are critical to the development of the regional IOOS components. We believe that the following business model components are most critical to the success of regional IOOS:

- ◆ *Strategy*. Strategy defines an organization's high-level approach to achieving a desired goal. It identifies the desired end state, as well as the key

stakeholders and their roles and responsibilities in supporting the achievement of the goal.

- ◆ *Organizational structure.* The organizational structure is the interconnection of functional activities that support an organization, program, project, or other activity. The organizational structure is intended to facilitate the completion of activities that support the achievement of the strategic goal. An organization's structure is usually based on its strategy, desired goal, and internal functional capabilities.
- ◆ *IOOS requirements and implementation plans.* Requirements define the specific, detailed activities that must be performed to get to the desired end state. The requirements provide the bridge from the strategy to the implementation plan. They also provide stakeholders with a common understanding of the effort required to achieve the desired outcomes. The implementation plan establishes responsibility for the detailed activities and outlines a performance schedule for these activities.
- ◆ *Funding.* This component of the business model addresses the financial resources available to invest in processes and assets. Federal agencies must compete for resources, both within the agency and across the executive branch, before obtaining congressionally appropriated funds. To obtain executive branch and congressional support, particularly in an era of declining availability of discretionary resources, an agency must be able to demonstrate the compelling benefit of a proposed effort, supported by measurable return on investment.
- ◆ *Communication.* The communication plan, along with selected communication channels, enables the organization to distribute its message to and receive feedback from stakeholders. The communication plan enables the organization to take a more holistic view of what types of messages should be delivered, when they need to be delivered, and what audiences should receive them. With a holistic view, an organization can design a comprehensive, yet flexible approach that supports the needs of all stakeholders. The communication plan typically depends on the organization's strategy, stakeholder roles and responsibilities, requirements schedule, and type and timing of required message delivery.
- ◆ *Investment processes.* The investment processes—plan, select, control, and evaluate—support decisions about the development and implementation activities required to reach the desired end state. These processes help to ensure that investments lead to measurable returns.

- ◆ *Investment funding mechanism.* The funding mechanism is the approach used to distribute funds to external organizations that support operational, developmental, or implementation activities. The funding mechanism must be appropriate to the level of effort to be undertaken. Information that should be considered when selecting a funding mechanism includes the type of support to be provided, the complexity of the activity, the expected funding period, and the level of task monitoring required.

These components serve as the means to coordinate the efforts of the broad range of stakeholders that will work together in the distributed implementation framework to develop IOOS. The business model also helps to ensure that these components are coherent and fully support the desired end state.

Chapter 3

Current NOAA-Regional IOOS Environment

The NOAA IOOS Program provides the link between national observing systems and regional observations, data management, and modeling. National observing systems, managed directly by federal agencies, are intended to support national priorities; RAs and RCOOSs are designed to support both local user needs and national IOOS requirements. RAs provide the primary framework for orchestrating the required collaboration within each region and are responsible for the design and coordinated operation of RCOOSs.¹ Thus, RAs provide the types of data, information, and products needed to address the estuarine and coastal issues experienced by the different regions.

To support the development of the regional component of IOOS, NOAA's goal is to move the regions toward the following long-term outcomes:²

- ◆ “Regions have a coordinated, functioning observing and data management infrastructure, developed with federal agencies, sub-regional system components, and local data network nodes, to create sustained collection and sharing of data and information at local, regional, and national levels;
- ◆ “Data providers within the regions deliver accurate and timely ocean observations through a common data integration framework to a range of consumers, including national, state, and local governmental organizations; operational, scientific and commercial entities;
- ◆ “Regions provide IOOS data that are integrated into user-specified tools and information products to demonstrate improved predictions and products at local and regional scales.”

According to the Ocean.US's January 2006 IOOS development plan, RAs are responsible for engaging public- and private-sector entities (state agencies, regional organizations of federal agencies, commercial enterprises, NGOs, tribes, academic institutions) in designing, operating, and improving RCOOSs, in order to ensure the provision of data and information that meet the needs of user groups in the respective regions. RAs have been working toward engaging regional stakeholders and defining the local needs that an IOOS should address. Each RA has a conceptual design for the regional component of IOOS, and each submits proposals in response to federal funding opportunity announcements. However, each region has its own local concerns. In addition, each RA, and its associated

¹ NOAA Coastal Services Center, *IOOS Regional Association Needs Assessment: Final Report*, October 2006.

² NOAA Announcement of Federal Funding Opportunity, FY 2008 Implementation of Regional Integrated Ocean Observing Systems.

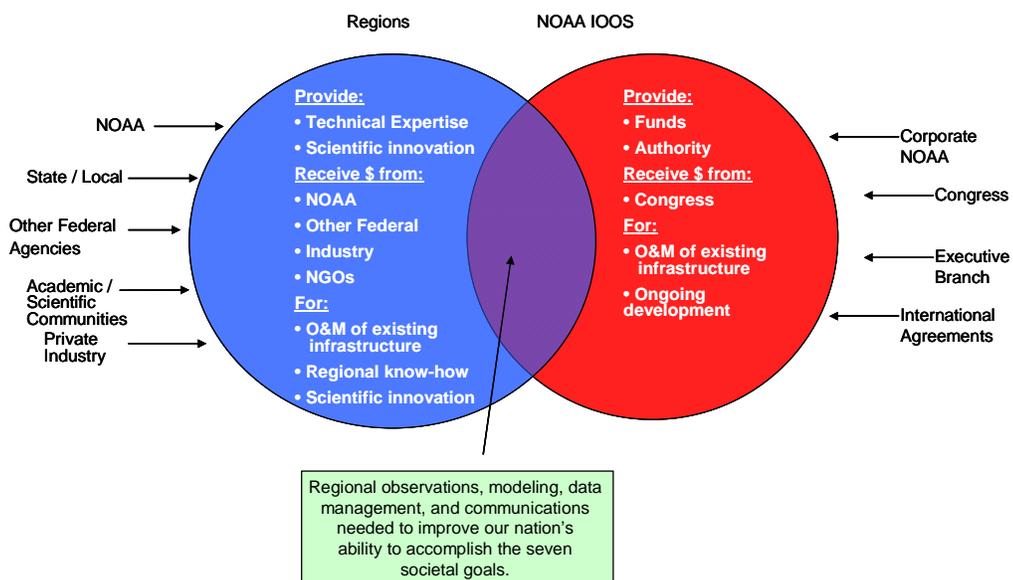
RCOOSs, are at various stages of development. Thus, there is no common approach for developing the regional IOOS.

To advance the development of the regional IOOS, regional organizations expect the IOOS Program to provide

- ◆ consistent funding levels for RA and RCOOS development and sustainment,
- ◆ clear and specific guidance on national requirements for the regional data management subsystem and national capabilities,
- ◆ assistance with engaging other NOAA partners at the federal level, and
- ◆ advocacy for resources within NOAA and with Congress by capturing and presenting the value of the regional development.

The differences between the NOAA and regional expectations and the variances in regional capabilities have limited NOAA’s ability to advance regional development at the rate expected. Both NOAA and the regions have specific constituents that influence the way they plan for operations. NOAA must consider the needs of internal NOAA programs for observation data, while adhering to the fiscal guidelines established by the Office of Management and Budget (OMB) and Congress. On the other hand, although RAs must be supportive of NOAA, they must also be responsive to state and local needs as well as to the needs of other end users. This environment, depicted in Figure 3-1, creates a situation in which the priorities identified by the regions may not completely align with the NOAA expectations.

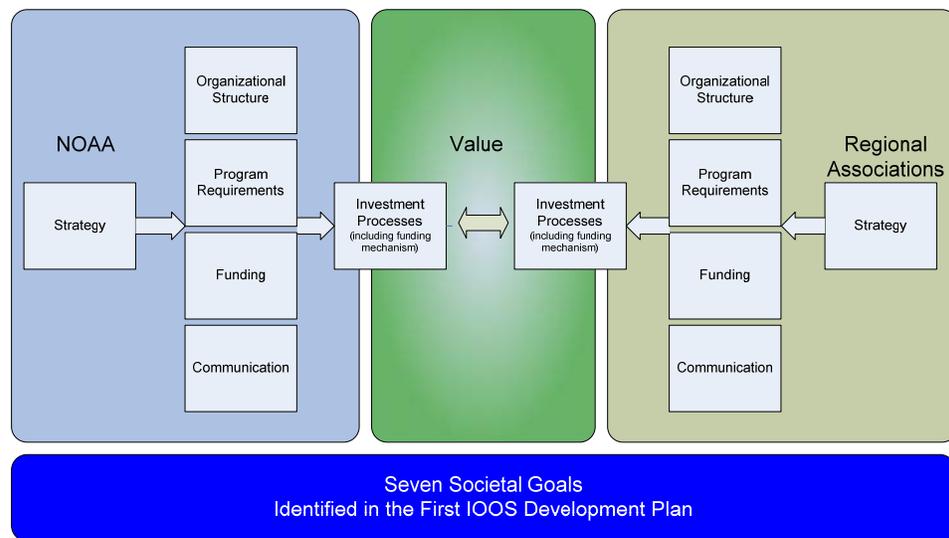
Figure 3-1. IOOS Development Landscape



Without clear and detailed federal guidance, and without a clear understanding of how they fit into the national IOOS environment, the regional organizations are likely to prioritize local needs first. Regional development focused primarily on regional needs is likely to lead to the development of uncoordinated and suboptimal systems. A distributed implementation environment, more than any other approach, requires that a common understanding be established among stakeholders of how each fits into and supports the IOOS and how they might help advance its development.

To assist with gaining an understanding of the NOAA-Regional IOOS environment, which in turn will inform the development of a new NOAA-Regional business model, this chapter reviews the key components of the current NOAA-Regional business model: strategy, organizational structure, IOOS requirements and implementation plans, funding, communication, investment processes, and investment funding mechanism. Figure 3-2 illustrates the components. Together, they should support the seven societal goals identified in the IOOS development plan.

Figure 3-2. Current NOAA-Regional Business Model



STRATEGY

Discussion

The IOOS strategy is based on the efforts by the U.S. Commission on Ocean Policy, the National Ocean Research Leadership Council, the National Science and Technology Council’s JSOST, and the Interagency Working Group of the National Oceanographic Partnership Program to outline a plan for the implementing IOOS. Their efforts produced the “foundational documents” that are currently being used to define the path to a national IOOS. These foundational documents include the following:

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- ◆ *Toward a U.S. Plan for an Integrated and Sustained Ocean Observing System*, National Oceanographic Partnership Program, 1999
 - ◆ *Building Consensus: Toward an Integrated and Sustained Ocean Observing System*, Ocean.US Workshop Proceedings, March 2002
 - ◆ *An Ocean Blueprint for the 21st Century*, U.S. Commission on Ocean Policy, September 2004
 - ◆ *U.S. Ocean Action Plan*, Bush Administration, December 2004
 - ◆ *The First U.S. Integrated Ocean Observing System (IOOS) Development Plan*, Ocean.US, January 2006.³
 - ◆ *IWGOO Strategic Plan(DRAFT)*, July 2007
 - ◆ *The NOAA IOOS Strategic Plan*, October 2007

IOOS PROGRAM STRATEGY

In December 2007, the NOAA IOOS Program office released the first strategic plan for the NOAA IOOS Program. This plan, which added detail to the NOAA IOOS vision and identified the goals and objectives for the NOAA IOOS Program—is consistent with the IOOS strategic plan under development by the IWGOO. The strategic plan outlined the activities that will need to be completed to implement NOAA IOOS. The intent of this strategy is to provide the guidance needed to plan the IOOS implementation.

REGIONAL IOOS STRATEGY

In March 2004, prior to the release of the NOAA IOOS strategic plan, Ocean.US held a Regional Organization Workshop in Washington, DC, to lay out a plan for building regional capacity for IOOS. Workshop participants, including regional groups and federal agencies, agreed to collaborate with Ocean.US in the formulation of criteria and procedures for certifying regional groups as RAs that are eligible for funding to design, implement, operate, and improve sustained RCOOSs as part of the U.S. IOOS.⁴ As part of the proposed certification process, RAs would be required to draft a business plan, including a funding strategy and a data collection management plan. Although a decision on whether to pursue RA certification has not been made, many of the RAs have developed business plans to outline their plans for regional development. Appendix A addresses the status of regional planning efforts.

³ Although developed under the sponsorship of Ocean.US, the development plan was approved by the Interagency Committee on Ocean Science and Resource Management Integration.

⁴ National Office for Integrated and Sustained Ocean Observations, *Building Regional Capacity for the IOOS*, Ocean.US Publication 5 (proceedings, Regional Organizational Workshop, Washington, DC, March 28–30, 2004).

It is clear that each region is attempting to support the IOOS development process by responding to requests to better structure their operations. However, it is also clear that the submitted business plans and conceptual designs present a variety of approaches.

Key Findings

The IWGOO strategic plan and NOAA IOOS strategic plan provide the first steps to the definition of a way ahead for NOAA and regional development of IOOS. Our discussions with representatives from the regions, the NOAA IOOS Program, and other NOAA programs, revealed that the IWGOO and NOAA IOOS strategies, along with the other foundational documents, provide a clear vision of the future for IOOS and provide the scope and content to support strategic planning. However, these documents do not provide sufficient detail about IOOS implementation plans and associated requirements to enable the regions to support IOOS development. These findings do not indicate a problem with the NOAA IOOS strategy, the foundational documents, or the larger IOOS vision. Instead, these findings point to a lack of guidance below the strategic level that would support regional IOOS development.

ORGANIZATIONAL STRUCTURE

Discussion

Well-defined organizational structures and processes—for both the NOAA IOOS Program and the regions—are critical to the successful development and sustainment of IOOS. Although NOAA performs the planning, coordination, and funding functions, regional organizations perform project definition, development, operation, and sustainment functions. Different structures and processes are needed to perform these different sets of functions, but they must operate seamlessly to support the full IOOS development life cycle.

IOOS PROGRAM ORGANIZATIONAL STRUCTURE

The NOAA IOOS Program was established in February 2007 to serve as the overall coordinator of NOAA's IOOS activities and to provide a consistent management function.⁵ The IOOS Program charter, approved in January 2008, identified the following program outcomes:

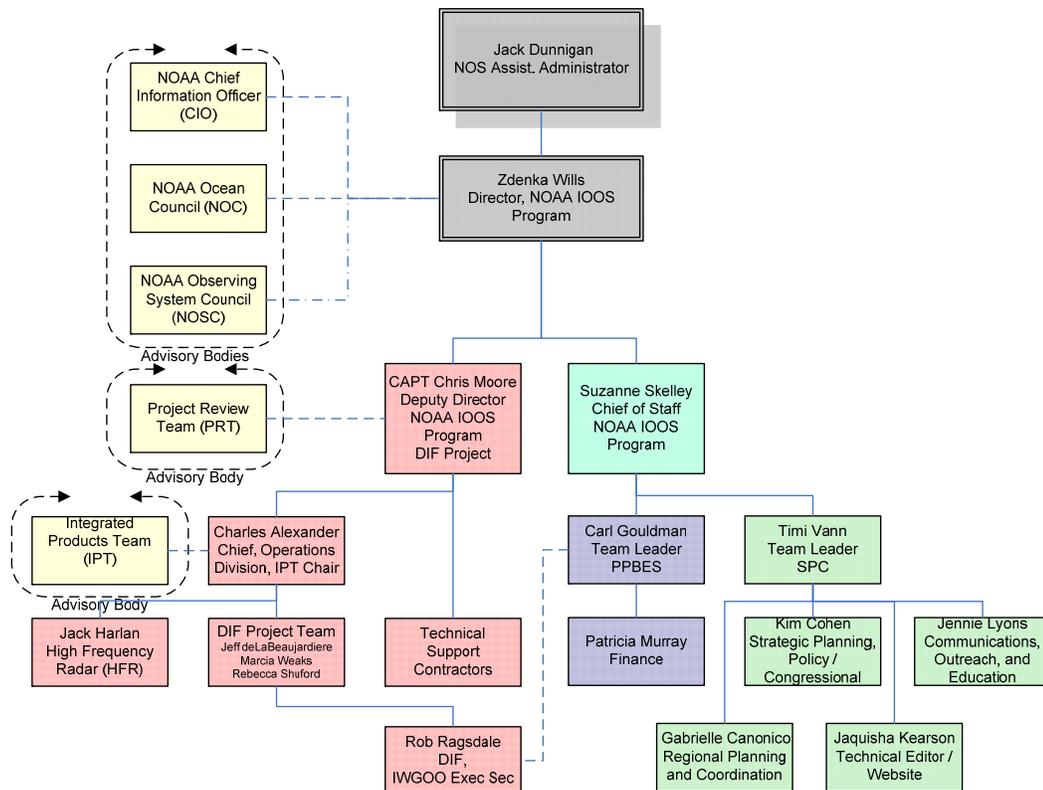
- ◆ Improve access to high-quality, integrated data
- ◆ Enhance data products and decision-support tools
- ◆ Advance the establishment of the U.S. IOOS by NOAA, other federal agencies, and RCOOS.

⁵ Draft IOOS Program charter, December 2007.

- ◆ Establish a functional management structure that addresses all aspects of NOAA IOOS, including management of IOOS within NOAA, management of regional observing systems, and coordination of interagency and international IOOS activities
- ◆ Develop and implement cohesive NOAA IOOS Program planning
- ◆ Maximize societal and economic benefits of IOOS through targeted research, education, and training
- ◆ Coordinate communications and act as an information broker to facilitate NOAA's distributed implementation of IOOS.

To help advance toward the achievement of these outcomes, the IOOS Program established the organizational structure illustrated in Figure 3-3. This structure supports the three primary functional areas of the IOOS Program Office: Data Integration Framework (DIF) Development and Data Management and Communications (DMAC); Management, Budget, and Programming; and Strategy, Planning and Communication. As the figure indicates, each NOAA IOOS Program Office functional area operates somewhat independently, with limited cross-function planning or activity.

Figure 3-3. NOAA IOOS Program Office Organizational Structure

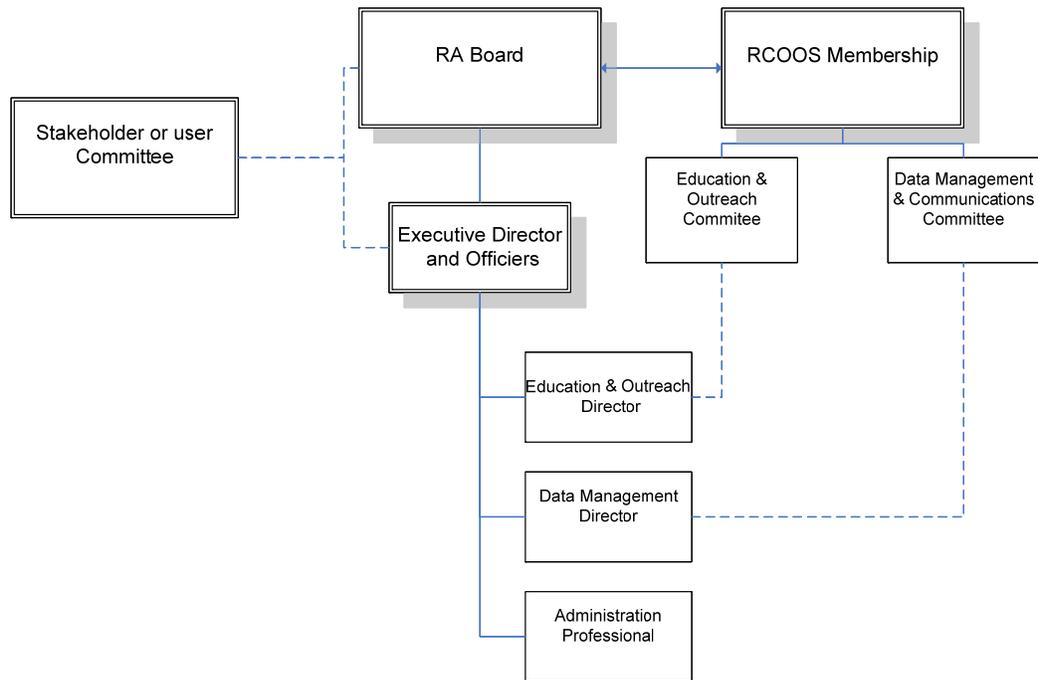


Before the NOAA IOOS program office, NOAA’s Coastal Service Center (CSC) was solely responsible for regional coordination and support for the awards under congressional directed funding. Currently, CSC’s role is to assist the NOAA IOOS Program with managing and coordinating NOAA’s annual regional funding and project selection processes. CSC works directly with the NOAA IOOS Program to provide guidance for the grants and cooperative agreements process, support development of announcements of federal funding opportunities (FFOs), review regional submissions, and assist with selection of award recipients.⁶

REGIONAL ORGANIZATIONAL STRUCTURE

Before 2004, the RAs were sustained through Coastal Ocean Technology System grants, with little guidance about organizational requirements or implementation. Since 2004, Ocean.US has provided detailed guidance about RA governance. As a result, the RAs have made considerable progress toward standardizing their governance structures. The RAs now have common organizational features such as stakeholder advisory boards, and they have processes in place for soliciting regional user needs. Figure 3-4 is a notional RA organizational structure based on the actual structures used by the RAs.

Figure 3-4. Notional RA Organizational Structure



⁶ Grants and cooperative agreements are financial assistance mechanisms with the primary difference being that cooperative agreements allow for substantial programmatic involvement between the funding agency and the recipient. (LMI, *Assessment of Funding Mechanisms for the NOAA Integrated Ocean Observing System Program Office*, Report NOA72T1, December 2007.) For the remainder of this report, the term cooperative agreements will refer to grants or cooperative agreements.

Differences still exist among the RAs in terms of their funding requirements, funding sources, core capabilities, and regional products and services. This is important because the uniformity of the RA organizational structure, by itself, can be deceiving. Many RAs, for instance, are connected to larger, more mature organizations in their regions that provide significant financial, coordination, and logistical support. Other RAs are essentially standalone organizations. Circumstances in the regions, such as the availability of strong and committed partners, drive much of the variance in RA products, services, and capabilities.

Key Findings

In our discussions with various IOOS stakeholders and subject matter experts, we found the following concerning the current organizational structure and processes underlying regional IOOS development:

- ◆ National IOOS guidance comes from more than one source, making planning and coordination roles and responsibilities unclear to regions.
- ◆ NFRA's role is not well understood.
- ◆ The maturity of RA and RCOOS organizations varies dramatically.

COORDINATION ROLES AND RESPONSIBILITIES

All of the RAs we spoke with mentioned the need for clear and consistent “top-down guidance” on capability development. Half of those interviewed noted that strategic guidance is coming from two different sources: Ocean.US and the NOAA IOOS Program. Nearly all of the RAs we spoke with expressed confusion about the roles and responsibilities of NOAA IOOS Program, Ocean.US, and IWGOO. For example, the funding and guidance roles are currently split between the NOAA IOOS Program and Ocean.US, resulting in confusion on the part of the RAs with regard to which direction they should follow and which organization is providing ongoing management of their efforts. Moreover, day-to-day contact with the RAs is primarily through CSC, with larger planning guidance, such as business plan development, coming from Ocean.US or, more recently, NOAA IOOS. For the majority of RAs, the perceived disconnects between their day-to-day contact with CSC and larger planning efforts are confusing and time consuming. This confusion is exacerbated by the perception that the other federal stakeholders are “slowly drifting apart” from the IOOS concept.

The RAs perceive that the IOOS strategy and guidance role is shifting away from Ocean.US toward the NOAA IOOS Program. However, the regions do not see this shift as a planned, coordinated effort between the two offices. As noted by one of the respondents, “We need one organization to take responsibility for the success or failure of the RAs.” Five other respondents also noted that for a distributed implementation system to function properly, only one organizational entity can assume the leadership role.

Several RAs believe that Ocean.US is playing an “increasingly diminishing role.” However, they believe that the coordination function assigned to Ocean.US—the regional link to the executive branch (via IWGOO), other federal agencies, and international integration efforts—is critical. To build an effective IOOS, a clear articulation of the roles of the various federal agencies, with associated accountabilities and responsibilities, is urgently needed. Regions need to see a single “lead” responsible for IOOS decision making.

UNDERSTANDING OF NFRA ROLE

Some regions believe that NFRA is the “honest broker” between NOAA and the regions, while others believe that it does not serve a very clear role in the regional planning process. Federal representatives, in particular, did not clearly understand NFRA’s role. These comments did not offer clear insight as to whether the strategy to use NFRA in a regional coordinator role was useful or not. However, NFRA may be better able to help the regions if it clearly articulated its role, its accountability, and the value it provides to the regions and federal representatives.

MATURITY OF RA AND RCOOS ORGANIZATIONS

In our review of regional business plans, conceptual designs, and proposals submitted in response to FFO announcements, as well as our discussions with regional representatives, we found varying levels of organizational development across all of the regions. Regions that have been in existence longer tended to have much more well-defined strategies, business plans, and cost requirements. Not surprisingly, newly established regions have either more loosely defined business plans or are still in early stages of business plan development. The RAs with a more extensive history of supporting ocean observation requirements tend to have more highly developed planning capabilities; in addition, they are more likely to consider end-to-end development requirements. RAs that are in nascent stages of development are still building their planning and operations capabilities. Established regions, therefore, are better able to illustrate the value generated by their efforts. This creates the potential for more developed RAs and RCOOSs to get more resources simply because they can state their business case better, even though the less-developed RAs may have a greater need for resources.

The capabilities of some regions are enhanced by the existence of state-funded institutions within their regions. Five of the RAs we interviewed were able to leverage state government resources and advanced coordinating entities, such as the Great Lakes Regional Collaborative or the Gulf of Mexico Alliance. These organizations, started through cooperation among state governments, are a ready-to-use vehicle for communication and collaboration across federal and non-federal partners in the regions. RA interaction with these organizations, where they exist, was characterized as extremely positive.

IOOS REQUIREMENTS AND IMPLEMENTATION PLANS

Discussion

The goal of the requirements development process is to take inputs from relevant stakeholders and translate the inputs into functional and technical requirements. This process allows the NOAA IOOS Program to work with the users to better understand operational needs, to define achievable development goals, and to develop realistic performance parameters to help ensure that the development process is on track. The NOAA IOOS Program is working with LMI to define detailed IOOS DMAC functional requirements that can be used to identify specific requirements for the regions. However, this process is not expected to be completed until FY10. Until then, regions have only the foundational documents to guide them on how to develop the regional IOOS components, except for the instances in which the NOAA IOOS Program provides specific technical guidance, such as guidance on the standards being developed for data content, transport, metadata, and quality control being developed by the program's DIF project.

The NOAA IOOS Program is planning program reviews with the RAs. These reviews should help provide a baseline understanding of the RAs' structure, planning objectives, and key accomplishments. Currently, the NOAA IOOS Program plans to visit three groups of regional organizations in FY08 and participate in three individual RA meetings.

Key Findings

In our discussions with various IOOS stakeholders and subject matter experts, we noted that they did not comment specifically about IOOS requirements and implementation plans. However, when we analyzed their comments on the investment process, we noted that many of the comments were symptoms of a lack of clearly defined IOOS requirements and implementation plans. These comments were as follows:

- ◆ The IOOS vision is too vague to support definition of regional IOOS plans.
- ◆ Regional business plans focus on regional priorities and do not completely align with evolving NOAA IOOS priorities.

IOOS VISION

Nine of the RAs believe that IOOS has a "real messaging problem." These RAs said that the IOOS vision expressed in the foundational documents attempts "to be all things to all people." LMI interpreted this comment to mean that the RAs perceive that the IOOS vision is so vague that it does not provide a sufficient framework to lay out achievable regional goals or to identify the concrete steps needed

to achieve those goals. Four of the RAs believe that clear guidance about what they should be providing does not exist. While vision and strategy documents should not be expected to provide implementation level of detail, these comments highlight the need for implementation guidance.

FOCUS OF REGIONAL PLANNING

Lacking clearly defined federal requirements, the RAs focus their planning on meeting regional needs. This is not out of line with the first IOOS development plan, which intended for RAs to support regional priorities, but ensuring that regional development supports national IOOS requirements should also be considered. Our discussions with the regions revealed that they are hungry for federal guidance that clearly defines the national need, including common capabilities that the RAs should seek to develop across the 11 regions. In fact, the need for more federal guidance about the capabilities and components of a national need was the most frequently mentioned response to the question “what would you want if you were king or queen for a day.” Without a coordinated effort to lead and synchronize national and regional planning efforts, the NOAA IOOS Program will find it difficult to integrate the separate regional development efforts after they have been completed.

FUNDING

Discussion

Until recently, the development of regional IOOS components was conducted as a result of congressional action, with directed funding jump-starting the IOOS development processes. Without a formal program or development plan, it has been difficult to establish program funding requirements and justification sufficient to meet NOAA or executive branch thresholds for obtaining desired program funding. In addition, the lack of accountability and metrics associated with programs supported by congressionally directed funding has made it difficult to substantiate progress toward meeting program goals, further hindering the ability to gain support for a sustained or increasing level of resources. As a result of these challenges, IOOS Program funding for regional IOOS development has declined significantly since it reached its highest level in FY05:

- ◆ FY05 \$29.8 million
- ◆ FY06 \$26.3 million
- ◆ FY07 \$21.7 million
- ◆ FY08 under review
- ◆ FY09 \$14.6 million (President’s Budget Request).

Key Findings

Our key findings related to funding are as follows:

- ◆ Unpredictable funding levels affect the ability of the RAs to plan effectively.
- ◆ When planning, RAs consider funding sources outside the NOAA cooperative agreement process.

EFFECT OF UNPREDICTABLE FUNDING LEVELS

Many of the RAs that we spoke with noted the difficulty in producing conceptual design documents with little or no idea about future funding levels. It is a challenge for them to plan effectively for systems operations and maintenance (O&M), management of stakeholder expectations, and future investments. Representatives from 10 of the 11 RAs, along with one federal entity, believe that a sustained level of base funding would lend stability and legitimacy to the RAs, as they engage stakeholders and plan for the future. All of the RAs agreed that NOAA should fund research and development on a competitive basis, but they expressed differing opinions about the amount of base funding required. Five of the RAs believe that base funding should cover only the sustainment costs of the RA activities, currently covered by the coordination cooperative agreements. Four of the RAs would like base funding to eventually cover the system O&M sustainment costs for equipment. The RAs estimated that their long-term system sustainment costs are between \$10 and 20 million for each RA, which is currently more than is awarded through the NOAA IOOS cooperative agreement process.

ADDITIONAL FUNDING SOURCES

The RAs' ability to pursue funds outside of the NOAA cooperative agreement process varies widely. A majority of the newer RAs rely completely on NOAA for funding. In contrast, the four most mature RAs request funding from numerous outside entities, including private-sector organizations, the Department of Defense, and state and local governments. Three of the RAs collect membership dues.

With the larger, more established RAs having alternative funding sources, their desire to support NOAA-specific requirements will likely be affected by the ability of the NOAA IOOS Program to provide sustained, predictable funding. In contrast, RAs that depend on NOAA funding for survival are likely to need a greater level of ongoing development support.

COMMUNICATION

Discussion

The NOAA IOOS Program is beginning to develop an IOOS communications strategy. As part of this strategy, the IOOS Program will define objectives and target audiences, identify key events for IOOS participation, and identify media to be used to deliver IOOS messages. The NOAA IOOS Program has launched a website and is working with senior managers to identify the best approaches for reporting IOOS progress.

Key Findings

In our review of the interactions between NOAA and the regions, we found little to no consistent communication other than Z-grams, regional conferences, and periodic RA visits. Most of the interactions occur at the CSC level during the cooperative agreement process. Our key findings can be stated as follows:

- ◆ IOOS has no structured communication process for the regions.
- ◆ No single source of communication exists for all IOOS development.

COMMUNICATION PROCESS FOR THE REGIONS

Seven of the RAs said that they have no structured ongoing communication with the IOOS program, with the exception of Z-grams. Although these RAs indicated that they enjoyed receiving these e-mails, they believe that NOAA does not have a single point for communication. One respondent noted that communicating with multiple NOAA programs, such as NDBC and CO-Ops, is frustrating. The RAs do not see any formalized process for inter-NOAA communication.

SOURCE OF COMMUNICATION

Seven of the regional associations stated that no single point of communication exists for all of IOOS. These RAs also pointed out the lack of a single point of communication in NOAA, because CSC, NOAA IOOS, NBBC, CO-OPS, and other programs all have different goals, personalities, and roles. One RA said that NOAA is a “multi-headed beast.”

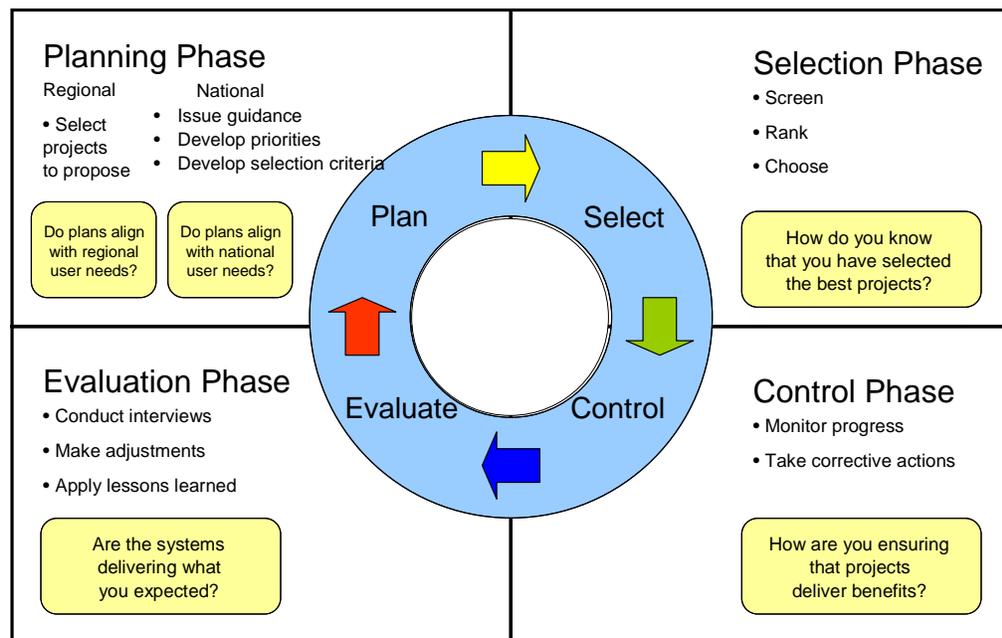
The problem becomes more extreme with cross-federal communication. Nine of the RAs believe that Ocean.US was not adequately filling its role as a cross-agency facilitator. Five of the RAs and a few federal partners believe that the NOAA IOOS Program should assume the role of federal coordinator, but two RAs believe that only Ocean.US, as a cross-agency body, could fill this role.

INVESTMENT PROCESSES

Organizations in both the public and private sectors use investment processes to create and capture value. A central tenet of the federal approach to investment management has been the plan-select-control-evaluate model, developed by OMB for application to IT projects. Since the model was initially implemented, OMB and the Government Accountability Office have expanded and refined it to fit non-IT-related investment processes.⁷ LMI modified the model further to fit the distributed IOOS implementation approach. The model provides a systematic way for the NOAA IOOS Program and its partners to look at current operational processes, define achievable development goals, develop realistic performance parameters that help to ensure that the development process is on track, identify disconnects from a value-driven system, and sustain the RAs while maximizing the return on investment for national and local users.

Figure 3-5 depicts the investment management model. The following subsections discuss the individual components of the model in more detail and present our findings.

Figure 3-5. Fundamental Phases of the Investment Management Approach



⁷ GAO, *Information Technology Investment Management: A Framework for Assessing and Improving Process Maturity*, GAO-04-394G, March 2001. For additional detail on the control phase, see also *Grants Management: Enhancing Performance Accountability Provisions Could Lead to Better Results*, GAO-06-1046, September 2006.

Plan

DISCUSSION

In the planning phase, an organization identifies and provides guidance on its mission and strategic priorities. IOOS's distributed implementation approach means that planning occurs at multiple levels. In such a system, strategically aligned regional and federal planning provide the highest value to regional and national end users, which is the hallmark of successful return on investment.

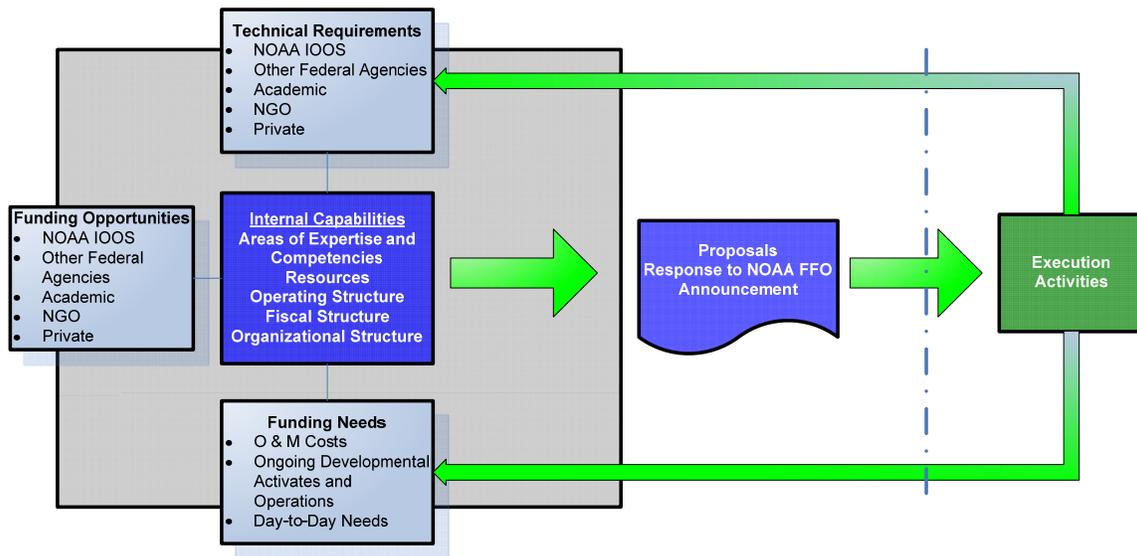
IOOS Program Planning

Ideally, the NOAA IOOS Program identifies requirements for the RAs through the FFO announcement in the cooperative agreements process. The FFO announcement is the primary vehicle for regional guidance and could be used to ensure that the selected programs directly support the IOOS strategic goals. This process should provide a mechanism for verifying the business case (or value proposition) to Congress, OMB, and NOAA planning and budget offices. In addition, ensuring that an essential link exists between national strategy and the selected projects, and that a defined partnership exists between the sponsoring unit and the project, strengthens and institutionalizes the national and regional stakeholders.

Regional Planning

The RAs are continually planning for future projects, and their efforts are focused by FFO announcements released by NOAA and other federal agencies. The FFO announcements used by NOAA require regional organizations to submit proposals outlining projects meeting the objectives of the FFO and detailing how awarded funds would be expended to achieve these objectives. During the planning process, the regional organizations must evaluate how best to respond to local user needs and meet the needs of NOAA IOOS. Figure 3-6 illustrates a notional regional proposal process.

Figure 3-6. Regional Proposal Process



When selecting projects to pursue, the regions consider NOAA and other priorities and technical requirements, as well as funding requirements to support sustainment of existing systems, development of new systems, and day-to-day operations. They must also weigh region-specific concerns that are most important to their constituents. Ongoing projects with day-to-day operations and sustainment costs also must be factored into regional planning processes.

The regional proposal planning process begins when RAs survey their partners and stakeholders to solicit feedback on user needs, evaluate technical requirements, and assess current funding needs and opportunities. The regional planning process is built on assessments of user needs. The regions use numerous tools to establish user needs, including the following:

- ◆ Alignment with federal priorities
- ◆ Alignment with state and local priorities (if existent)
- ◆ Formal surveys
- ◆ Conferences and workshops
- ◆ One-on-one visits with key stakeholders
- ◆ Public forums
- ◆ Needs established from recent environmental emergencies.

The RAs prioritize the identified needs and then compare the priority needs against current internal capabilities to arrive at potential products. In general, the difference between current resources and capabilities and the resources and capabilities needed to develop products is captured in the proposals.

KEY FINDINGS

Our discussions with regional representatives, NOAA IOOS Program representatives, and representatives from other NOAA programs revealed three key findings related to investment planning:

- ◆ FFO guidance is unclear
- ◆ National guidance is not in sync with the overall cooperative agreement process.
- ◆ The regions' commitment to soliciting and meeting user needs varies.

FFO Guidance

Nine of the RAs expressed some confusion about national expectations after reading the FFO announcement. One RA thought that the announcement failed to communicate expectations at all and that it was concerned only with page lengths and other “small scope” details. Several RAs said that the mission goals outlined in the FFO are too vague to guide real planning. Eight of the RAs stated that a lack of specificity in the FFO guidance and in the foundational documents makes it difficult for them to plan for execution activities. These RAs also expressed a strong desire for NOAA to articulate what “it is looking to get out” of the grants/cooperative agreement process to enable RAs to better plan against these expectations. In addition, several RAs noted that the variance in reviewer feedback, during the selection phase, was the direct result of unclear guidance about national needs and expectations. Although scoring criteria exist, it is difficult to score categories such as “project importance” without clear guidance about what capabilities the national IOOS is trying to build.

Synchronization of National Guidance and Cooperative Agreement Selection Process

Nine of RAs that we spoke with said that the federal partners did a poor job of synchronizing federal planning guidance and the cooperative agreement selection process. This poor synchronization led to RA confusion and frustration. For example, three of the RAs believed that the evaluation panel “punished” them for a lack of specificity in their FY07 implementation proposals, especially in years two and three. The conceptual design studies, however, were not required at that point (and not in response to the FFO announcement). Because planning guidance is provided to the RAs by two different entities—Ocean.US and NOAA IOOS Program/CSC—the confusion expressed by the RAs is not unexpected.

In addition, 10 of the RAs noted a lack of follow-up in the business planning process, and 8 RAs mentioned that they had turned in planning documents, but received no comments or feedback at all.

Regions' Commitment to Meeting User Needs

All regions say that they are building a system based on user needs, but they demonstrate varying degrees of commitment to meeting those needs. Seven of the RAs leverage highly formalized processes, including ongoing surveys and conferences, to identify regional user needs. Two of the RAs depend largely on informal mechanisms, such as professional relationships, and the two remaining RAs have no process at all to identify users and to solicit their requirements. However, all 11 RAs have leveraged their committee-based governance structures to solicit input from users.

Select

DISCUSSION

In the selection phase, the sponsoring organization (1) identifies and analyzes each project's risks and returns before committing significant funds to any project and (2) selects those projects that will best support its mission needs. This process should be repeated each time funds are allocated to projects, reselecting even ongoing investments.

CSC, before committing significant funds to any project, identifies and analyzes each project's risks and returns. Currently, CSC has two cooperative agreement processes, one for coordination and one for RCOOS development (implementation). CSC separated these processes before NOAA established the IOOS Program. The separation was in response to guidance from the IWGOO and Ocean.US to start funding the RAs during an execution year of coordination cooperative agreements.

The cooperative agreement process is the primary "process of interaction" between the NOAA IOOS Program and the RAs. (Appendix C contains a flow chart illustrating how the FY07 cooperative agreement process worked.) The purpose of this process is to select and fund those regional projects deemed to be most supportive of the advancement of regional IOOS development. CSC administers the cooperative agreement process, with oversight from the NOAA IOOS Program. CSC drafted the initial FFO announcement with input from NOAA IOOS Program. CSC utilized a review panel to evaluate the proposals submitted by the regions. The panel used criteria established by CSC, with input from the NOAA IOOS Program and the NOAA General Counsel. The FY07 review criteria were as follows:

- ◆ Importance/relevance and applicability of the proposal to program goals (30 percent)

- ◆ Technical and scientific merit (25 percent)
- ◆ Overall qualifications of the funding applicant (15 percent)
- ◆ Project costs (15 percent)
- ◆ Education and outreach (15 percent).

CSC conducts an initial administrative screening to determine compliance with requirements. At least three individual reviewers then rank all proposals in accordance with the evaluation criteria above. The FFO announcement authorizes CSC to select projects for funding based on the following:

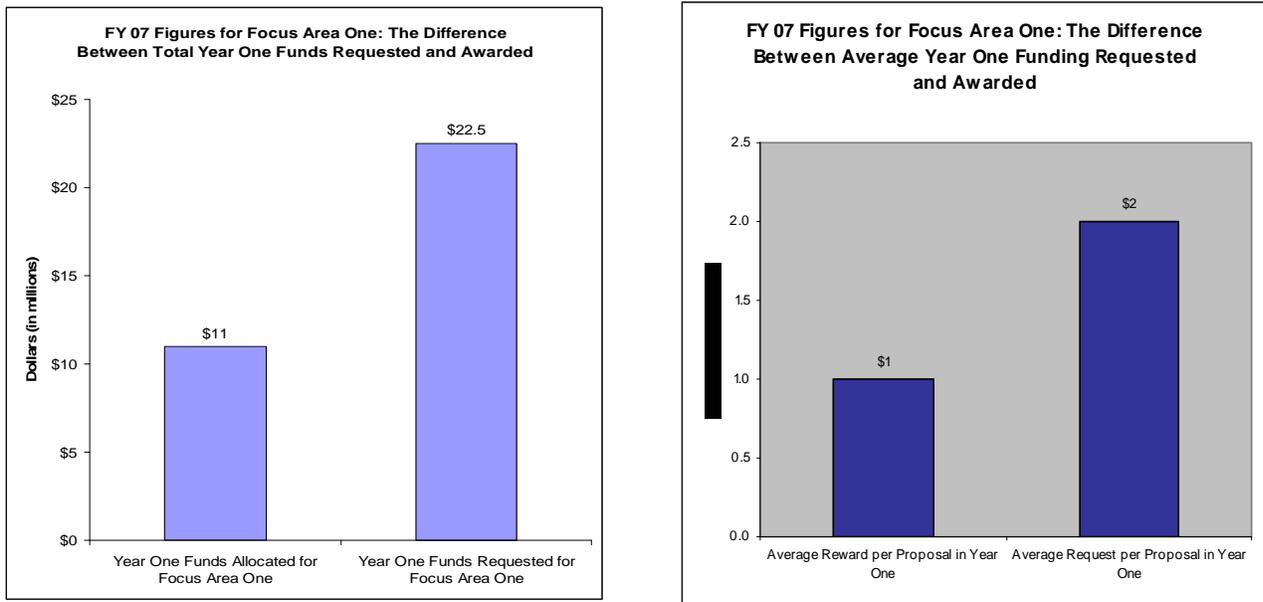
- ◆ Availability of funding
- ◆ Balance/distribution of funds by
 - geographic location,
 - type of institution,
 - type of research partner
 - research area, and
 - project type
- ◆ Duplication of other projects funded or considered for funding by NOAA and other federal agencies
- ◆ Program priorities and policy factors
- ◆ Applicant's prior award performance
- ◆ Partnerships with/participation of targeted groups
- ◆ Adequacy of information necessary for NOAA personnel to determine compliance with the National Environmental Policy Act and to draft documentation before making recommendations for funding to the CSC.

The FY07 IOOS FFO announcement sought proposals for 1- to 3-year grants and cooperative agreement projects that address three focus areas:

- ◆ Development of RCOOSs
- ◆ IOOS application and product development for regional stakeholders
- ◆ Data management and communication by local data networks nodes.

As Figure 3-7 illustrates, the difference between funds requested and funds received in focus area one, for instance, was substantial; NOAA awarded RAs only about half of what they requested. Before awarding funds, CSC asked the RAs to rescope their statements of work (SOWs) to the level of actual funding available. CSC also provided some guidance about which capabilities to remove or scale down, depending on the difference between the award and the proposed amount. The awardees used their councils and executives to remove or reduce selected aspects of their proposals. A few RAs were able to leverage other resources to fill funding gaps and thus did not have to remove or scale down proposed activities. The revised SOWs were not re-reviewed by the selection panels.

Figure 3-7. Total and Average Funding Requested and Awarded



KEY FINDINGS

In our discussions with federal and regional representatives and subject matter experts, we identified the following findings related to investment selection:

- ◆ CSC has done a good job addressing issues in the cooperative agreements process.
- ◆ Better guidance on expected award size would better align potential outcomes with project selection and reduce proposal level of effort.
- ◆ RAs want more time to respond to FFO announcements.
- ◆ RAs want longer funding cycles.

CSC Responsiveness

CSC has made a considerable effort to identify and address some of the problems related to the cooperative agreement process. Table 3-1 lists the key issues and indicates when each was raised. In our discussions, the regions were very positive about the steps CSC has taken to correct deficiencies in the cooperative agreement process.

Table 3-1. Issues with Cooperative Agreement Process

Issue	NOAA panel feedback	7/10/2007 NIFRA concerns	8/14/2007 informal discussions	LMI regional interviews
A competitive process is inconsistent with the goal of building a national system.		◆		◆
More time is needed to respond to the FFO.				◆
FFO guidance needs to be clear and more specific, including milestones.				◆
Funding strategy should be made clear early in the process.	◆			
No explicit filtering mechanism endorses the proposals by regions.	◆	◆	◆	
Panelists are assigned areas outside of their expertise.	◆		◆	
Evaluation criteria are inconsistent.	◆		◆	
Applicants should have an opportunity to address panelists' comments.				
Longer funding cycles should be allowed.	◆	◆		◆
Processes for communication with applicants need to be more consistent.			◆	◆

Guidance on Expected Award Size

Although it is very difficult for NOAA to predict award funding availability at the time an FFO announcement is drafted, large disparities in proposal scope and final award size result in a distortion in the selection process and assessment challenges in the control phase as well as extra effort by the proposers in the initial submission and in the rescoping effort, which also consumes government resources. When a project is selected based on proposal merit and the final award differs significantly from the proposal, the merits of the final rescoped project may differ significantly from those on which its initial selection was based. Entertaining a larger number of smaller proposals would not reduce the preparation effort, but the government would receive products or services that are more closely

aligned with the selection criteria. Moreover, the requirement for rescoping would be eliminated.

Time for Responding to FFO Announcements

The timing of the FFO announcements is largely driven by the availability of funds, but in the last 2 years, the announcements have been delayed due to continuing resolutions in Congress. Four of the RAs said that the timing of the FY08 coordination FFO announcements made it difficult to draft a good proposal. Complaints about the timing of the FFO announcement came from RAs that had a dispersed group of executive board members, as opposed to RAs that are more centralized. RAs also noted that it is difficult to assemble a good team of project partners in the time available.

Funding Cycles

The RAs have consistently argued for 5-year funding cycles, which will reduce the time they must spend drafting proposals and will improve the reliability of funding. Many of the respondents think that the current 1- to 3-year cycles place an undue burden on the regional proposal teams, which tend to be spread across a wide geographic area.

Five-year award cycles are common in NOAA. For example, the NOAA Climate Program, OCO, uses 5-year cooperative agreements to fund its regional components. However, with the current variability in the IOOS Program regional funding level, long-term (5 year) cooperative agreements could pose the risk of consuming all appropriated funding in years subsequent to the initial award, minimizing the program's ability to support new efforts and achieve geographic diversity. When the IOOS Program achieves stable funding levels, longer term cooperative agreements may become feasible.

Control

DISCUSSION

In the control phase, the organization ensures that, as projects develop and investment expenditures occur, the project continues to meet mission needs at the expected levels of cost and risk. If the project is not meeting expectations or if problems have arisen, steps are quickly taken to address the deficiencies. If mission needs have changed, the organization can adjust its objectives for the project and modify expected project outcomes.

For the NOAA IOOS Program, the control phase begins after the disbursement of funds to the regions. The NOAA IOOS Program and CSC try to ensure that the RAs continue to meet mission needs at expected cost levels. To monitor the RAs' performance, CSC collects semi-annual reports from the RAs, which list activities performed under the cooperative agreements. The cooperative agreement manager

at CSC examines the progress and financial reports against stated objectives in the proposal and then approves or disapproves the funding for the next year.⁸

To achieve an effective level of financial support in the PPBE system, NOAA programs must continually identify the value of their investments. As the source of regional IOOS funding, the NOAA IOOS Program must prove that its investments align with its strategic objectives and create value for end users. The IOOS Program must monitor the outcome of its investment efforts to ensure the value generated is identified, and low-value generating efforts are redirected to more potential activities.

KEY FINDINGS

In our interviews, we identified the following findings related to the control phase:

- ◆ Progress reports are activity focused, rather than outcome focused.
- ◆ Compliance oversight to ensure that targets are met is limited.

Activity-Focused Progress Reports

Until recently, the content of progress reports was simply a chronology of activities performed by the RAs. For example, progress reports from the FY05 coordination agreements focus on conferences conducted and meetings held. The milestones presented in the FY08 coordination cooperative agreement proposals are a major improvement to the performance measure process, because they link specific objectives and milestones to deadlines. However, the activities identified in the FY08 proposal cannot be considered performance measures. Ideally, performance measures would enable an assessment of progress toward meeting an established goal. With the current milestone format, it is still unclear if awardees successfully met their objective of engaging stakeholders. Several RAs and representatives from federal agencies expressed concern that the current progress reporting process fails to reflect measurable progress because of a lack of performance measures.

Eight of the RAs said that they are open to the idea of negotiated, formal performance metrics. Six of the RAs also suggested that good performance metrics are a vital component of an IOOS business case and would help to prove that the program is efficient and effective. However, there was general consensus that identifying good metrics and data for measuring progress will take a focused effort, given the uncertain nature of the work to be performed.

⁸ As of January 2008, CSC has not declined next-year funding to a grant or cooperative agreement.

Compliance Mechanism

One RA and one federal representative observed that there is no compliance mechanism to ensure that RAs meet milestones and accomplish objectives. In general, our interviewees think that objectives and milestones must be more specific and that progress toward meeting goals should have a larger role in the funding renewal process, as well as in future selection processes. These people also noted that there is no formal mechanism for taking corrective action for underperforming projects.

Evaluate

DISCUSSION

During the evaluation phase, actual versus expected results are compared after a project has been fully implemented. The purpose of this comparison is threefold: (1) assess the project's impact on mission performance, (2) identify any changes or modifications to the project that may be needed, and (3) revise the investment management process based on lessons learned. In short, the focus of the evaluation phase is to identify the benefits generated by the awardees.

KEY FINDINGS

In our interviews, we identified the following findings related to the evaluation phase:

- ◆ No formal process exists for collecting and disseminating lessons learned.
- ◆ Evaluation activities are limited.

Collection and Dissemination of Lessons Learned

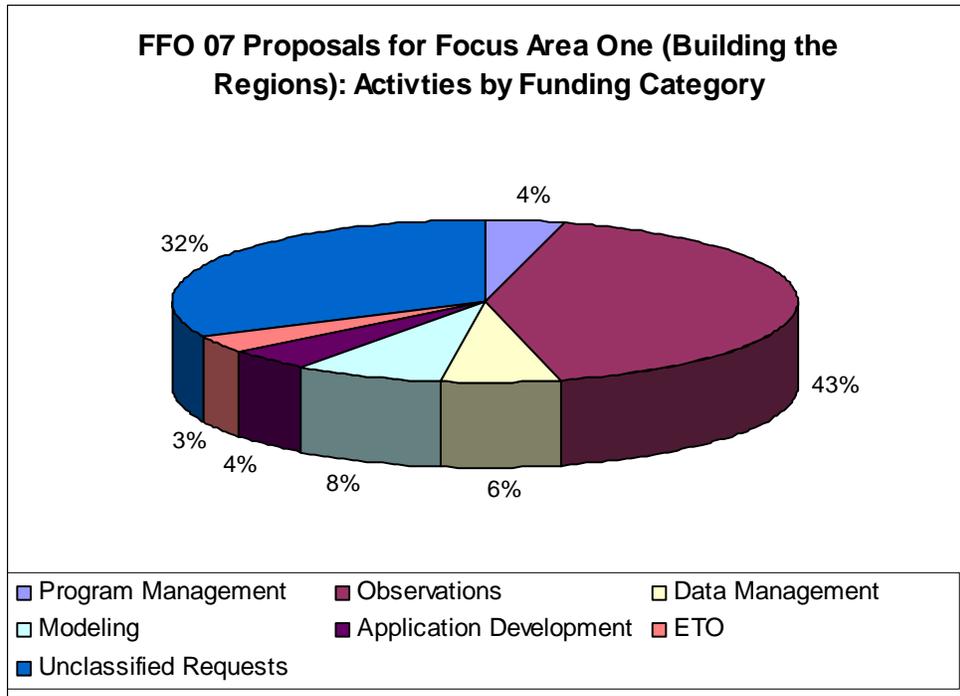
Many of the regions were unaware of the activities, either successes or failures, of the other RAs. Although Ocean.US holds monthly phone conferences for the regions to discuss lessons learned, the RAs described these calls as “unhelpful.” Several of the RAs said that the information collected from the regions in progress reports is difficult to understand.

Evaluation Activities

The FFO announcement states that prior performance will be a criterion by which NOAA makes funding decisions. Nevertheless, we did not observe a rigorous means to link performance to future funding. This is the result of problems discussed in other investment phases. In particular, the inability to link progress reporting to clear outcomes makes it difficult to summarize program-wide achievements to senior leadership in a succinct and compelling manner.

For instance, for the FY07 implementation cooperative agreements, 72 percent of the total awards were in focus area one. Figure 3-8 maps proposed funding to high-level work functions. As the figure illustrates, 32 percent of requested funds could not be attributed to a high-level work function. This is not surprising because the FFO guide did not request this level of detail in the proposals. This figure is not intended to reflect poorly on the quality of the proposals. Instead, it demonstrates the lack of detail requested and the associated difficulty for performance tracking.

Figure 3-8. Mapping of Proposed Funding to Work Functions



INVESTMENT FUNDING MECHANISM

Discussion

In FY07, the NOAA IOOS Program began the transition for funding regional IOOS development from congressionally directed to competitively awarded cooperative agreements.

Key Finding

During the August 2007 meeting between the NOAA IOOS Program, CSC, and NFRA Executive Board, and in subsequent discussions, numerous federal and regional representatives and subject matter experts raised the concern that use of a competitively awarded, cooperative agreement process, rather than an outcome-based funding mechanism, might run counter to the goal of building a national capability. After review, we determined that there was a lack of understanding and use of the full range of business processes associated with funding instruments, acquisition (contracts) and financial assistance (grants and cooperative agreements).

One of the goals of the NOAA IOOS Program is to build and sustain a national network of RAs that meets both national and local user needs. Five of the RAs that we spoke with believe that the cooperative agreement process used for FY07 might be appropriate for R&D pilot projects, but creates a number of issues when used for the development of a national operational system. Specifically, these regions expressed concern that the more developed RAs will continue to do well in the cooperative agreement process while others will not, with the entire system suffering as a result. NFRA also expressed this concern in July 2007 and recommended that NOAA and NFRA examine other models of competitive funding as they work toward a sustainable funding structure that promotes the development of operational systems that support user needs while still ensuring that they are based on sound science and the latest technology. Outcome-based criteria that focus on the products developed by the end of the funding cycle should be part of the process.

Because of this concern, LMI conducted a separate review of potential business arrangements and investment mechanisms that could be used to support regional IOOS coordination and development.⁹ The results of this review indicated that the business processes associated with both contracts and financial assistance are sufficiently flexible to support program objectives.

Table 3-2 details the key findings related to the support of program objectives.

⁹ LMI, *Assessment of Funding Mechanisms for the NOAA Integrated Ocean Observing System Program Office*, Report NOA72T1, December 2007.

Table 3-2. Potential Strategies for Achieving Program Outcomes

Program goal	Potential acquisition solution	Potential financial assistance solution
Achieve tangible program results	Require contractual deliverables Use performance-based acquisition, including performance measurements tied to program results	Incorporate performance metrics, including quantitative metrics, as appropriate, into grant/cooperative agreement awards Require reports to address achievement of those metrics
Ensure adequate national program coverage	Design competition to result in at least one award per defined region (potentially by limiting competition)	Design competition to result in at least one award per defined region (potentially by limiting competition)
Sustain regions (RAs and RCOOSs) and improve accountability	Define requirements for regional activities, with incentives and disincentives for specified performance levels	Clearly specify reporting requirements and other accountability provisions and enforce them (through payment or other means) Ensure substantial involvement in cooperative agreement helps achieve program goals and objectives
Minimize personnel impact	Award contracts with maximum durations (e.g., base year plus option years) Minimize amount of federal oversight by awarding fewer contracts and selecting appropriate contract types	Make awards with maximum durations

In addition, the study found that the government, using either the acquisition or financial assistance process, can establish technical evaluation criteria that will enable the NOAA IOOS program to fund IOOS development regionally:

Whether using an acquisition or financial assistance instrument, the government business process involves soliciting proposals or applications and evaluating them. Advance planning by business and program professionals enables the selection of proper evaluation criteria to enable achievement of program goals and objectives.

Under acquisition processes, the government typically evaluates an offeror's proposal across three factors: price or cost, technical (including past performance), and management. Within those broad factors, the government can create subfactors that represent key areas of importance to be considered in source selection.

For financial assistance processes, NOAA uses five evaluation criteria.¹⁰ These criteria exist as a result of a NOAA standardization effort; yet, tailoring is possible. For example, not all five evaluation criteria need to be used. The criteria can be modified (for example, a substitution, deletion, or change in emphasis), and weights can be assigned to emphasize program values. The review against the evaluation criteria is advisory to the selecting official, who can choose successful awardees based on seven

¹⁰ The five evaluation criteria are (1) importance and/or relevance and applicability of proposed project to the program goals, (2) technical/scientific merit, (3) overall qualifications of applicants, (4) project costs, and (5) outreach and education.

selection criteria.¹¹ Identification of the five evaluation criteria and seven selection criteria in the FFO announcement puts respondents on notice that factors other than technical acceptability come into play when determining who will receive an award.”

SUMMARY

Considering the range of concerns expressed by the RAs, it is clear that a significant amount of confusion remains about several aspects of the national IOOS:

- ◆ What is the NOAA IOOS Program’s plan for developing regional IOOS?
- ◆ What are the expectations for the regions?
- ◆ What should the regions be doing to respond to these expectations?

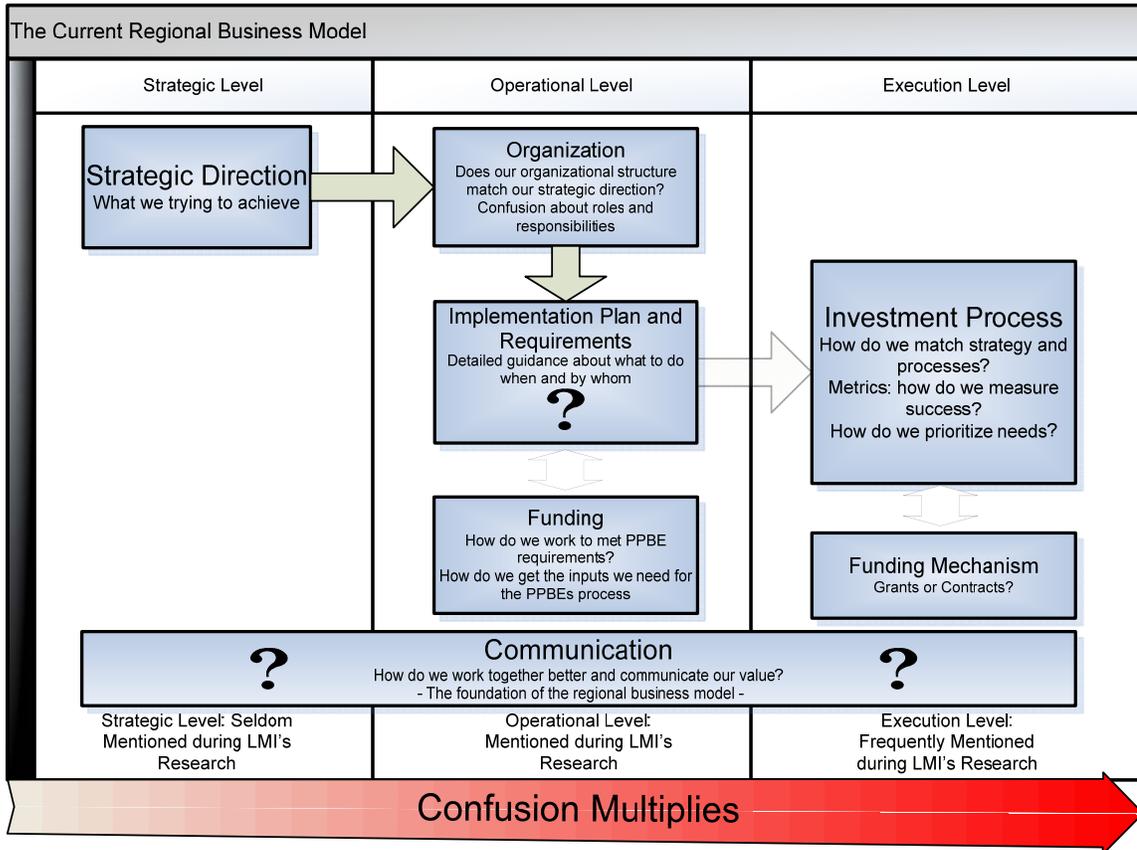
The existence of these and other issues not only will undoubtedly slow the regions’ ability to develop a regional IOOS, but also will hinder advancement of the national IOOS. Figure 3-9 illustrates the effect of this confusion.

In short, the lack of specific guidance at each level of planning affects every subsequent level. This means that without a specific implementation plan and defined priorities, NOAA diminishes its ability to select an appropriate funding mechanism—and to define specific requirements and performance standards.

In addition, without a cohesive organizational structure, funding, and a requirements and performance measurement process, communication planning and value presentation is almost impossible. The NOAA IOOS Program must address all of these areas to position itself to successfully develop IOOS using the planned distributed implementation approach.

¹¹ The seven selection criteria are (1) funding availability, (2) funding balance/distribution, (3) uniqueness of the project, (4) program priorities and policies, (5) applicant’s prior award performance, (6) participation of targeted groups, and (7) adequacy of information to enable government National Environmental Protection Act (NEPA) determination.

Figure 3-9. Impact of the Current Business Model



Chapter 4

Recommendations

The NOAA IOOS Program, Ocean.US, NDBC, NFRA, the RAs, and others have been working hard to improve the effectiveness and efficiency of regional IOOS development. Most of the quick and easy solutions have been, or are being, implemented. Still, much room is left for improvement, and the NOAA IOOS Program cannot achieve this improvement with a single action. Instead, to achieve lasting, meaningful change, the NOAA IOOS Program must ensure that all of the components of the business model are aligned to support the IOOS strategy.

Recognizing that the components of the business model have different levels of specificity, LMI, when developing recommendations for improving the NOAA IOOS regional business model, grouped the components into three sets:

- ◆ High-level business model components—strategy, organizational structure, IOOS requirements and implementation plans, funding, and communications
- ◆ Investment processes
- ◆ Investment funding mechanism.

This approach provides the NOAA IOOS Program a range of choices to consider, rather than a point solution.

This chapter begins with a discussion of the criteria we used to select recommendations. It then presents our specific recommendations for the three sets of business model components.

SELECTION CRITERIA

To ensure that LMI provided recommendations that ultimately will lead to the development and sustainment of a national network of regional observing systems to support both national and local needs for ocean information, the NOAA IOOS Program asked us to address the following criteria:

- ◆ Alignment with goals and objectives for both the NOAA IOOS Program and the RAs
- ◆ Consideration of implementation cost, risk, complexity, and effect on key stakeholders
- ◆ Alignment with OMB standards and GAO best practices.

We made every effort to provide recommendations that address these criteria and meet both NOAA and regional goals, objectives, and expectations. However, when federal mandates concern NOAA equities, NOAA’s responsibilities must take priority over regional goals, objectives, and expectations.

The following subsections discuss each criterion. The criteria are neither sequential nor prioritized; they must all be part of a larger solution to the business model.

Goals and Objectives

NOAA IOOS’s strategic plan lists numerous activities that link to components in the business model. Table 4-1 maps selected elements of the strategic plan to the business model components.

Table 4-1. Selected NOAA IOOS Strategic Plan Elements Mapped to Business Model Components

Component	Strategic plan elements
Strategy	Coordinate NOAA’s interagency and international IOOS activities
Organizational structure	Define and formalize the roles, responsibilities, and management structure associated with NOAA’s distributed IOOS implementation structure
IOOS requirements and implementation plans	Establish a process to support sustained management of regional observing systems
Funding	Sustain regionally based management of subregional observing systems to maximize contributions to U.S. IOOS
Communication	Communicate roles and responsibilities of the NOAA IOOS Program to NOAA, regional, and external IOOS communities Develop a communications plan, including core messages and target audiences, to guide how the NOAA IOOS Program and partners communicate with key internal and external stakeholder groups
Investment processes	Establish a process to support sustained management of regional observing systems Develop a common set of performance goals and measures with NOAA IOOS and other federal and regional partners
Funding mechanism	Implement a competitive, performance-based funding process for subregional observing systems that meets high-priority U.S., NOAA, and regional IOOS needs

The strategic plan elements point to, but are not necessarily, NOAA IOOS Program goals and expectations for each business model component, because NOAA has yet to create an implementation plan for the regional enterprise. In general, the NOAA IOOS Program has implicit expectations for each component, as reflected in its strategic plan elements. NOAA IOOS wants the components to interact in such a way that enables the development and sustainment of a national network of regional observing systems that will meet both national and local needs for ocean information. (The strategic plan elements are not fixed. The

NOAA IOOS Program has committed to reviewing strategic activities within 3 years as the distributed program implementation concept is tested.)

The RAs have expressed their goals, objectives, and expectations in numerous documents and forums, including the following:

- ◆ Regional IOOS Coordination Workshop in 2004
- ◆ The First IOOS Development Plan
- ◆ CSC’s 2006 needs assessment
- ◆ NFRA’s informal discussions with NOAA IOOS in August 2007
- ◆ NFRA meeting in Florida in October 2007
- ◆ LMI discussions with RA representatives in January 2008.

In many cases, when the RAs point out deficiencies, they are really stating implicit assumptions about their goals, objectives, and expectations. Table 4-2 summarizes these implicit and explicit goals, objectives, and expectations and maps them to the business model components.

Table 4-2. Selected RA Goals, Objectives, and Expectations Mapped to Business Model Components

Component	RA goals, objectives, and expectations
Strategy	A detailed and focused strategy that the regions can use to prioritize and evaluate different investment portfolios
Organizational structure	A clear articulation of roles and responsibilities and clear division of labor at the federal level
IOOS requirements and implementation plan	Clear technical requirements that describe what is to be built, by whom and when
Funding	A sustained, predictable level of funding that grows over time
Communication	For all IOOS development, a point of communication that enables easy access to other NOAA programs and other federal agencies
Investment process	Clear, consistent, and focused guidance about national needs, approaches to meeting those needs, reporting criteria, and ways to capture socioeconomic data
Funding mechanism	A mechanism that allows for some degree of base-level funding

Implementation Considerations

We considered all recommendations in the context of the following:

- ◆ **Cost:** What resources (human and financial) are required to support the recommendation?
- ◆ **Risk:** What risks are associated with the recommendation?
- ◆ **Complexity:** How complex is it to implement the recommendation? Implementation complexity is often related to implementation risk.
- ◆ **Effect on key stakeholders:** How will IOOS clients, partners, and other stakeholders be affected?

We eliminated some potential recommendations because of their costs, risks, complexity, or negative effects on stakeholders. The eliminated recommendations met the goals, objectives, and expectations of the NOAA IOOS Program and the RAs, but the potential benefits were not commensurate with the implementation considerations. For example, we did not propose recommendations that adversely affect the products clients depend on, diminish the capabilities of key partners, or alienate stakeholders. Whenever feasible, we proposed recommendations that seek to strengthen, not weaken, the collaborative bonds that drive IOOS.

OMB Standards and GAO Best Practices

The recommendations align with OMB standards and GAO best practices, where they exist. The applicable GAO guidance is focused on one specific component of the business model: investment processes. GAO guidance is very specific about investment processes; it includes best practices, prerequisites, and organizational commitments for the planning, selection, control, and evaluation phases of an investment model. In contrast, GAO guidance is less helpful for the other business model components. For instance, GAO states the need for an overarching strategy, but it does not dictate the components or aims of strategy; that is left to the discretion of the agency or organization.

HIGH-LEVEL BUSINESS MODEL COMPONENTS

Strategy, organizational structure, requirements and implementation plans, funding, and communication form the foundation for any successful development effort and for any business model. The use of the distributed implementation approach makes these components even more critical to IOOS success, because all of the key stakeholders must share a common vision of how IOOS will be developed and what their role is in developing IOOS.

The recommendations that follow will help the IOOS Program address many of the NOAA-Regional business model findings identified in Chapter 3. The recommendations focus primarily on the enhancement of the interactions between NOAA and the regions. However, some of the recommendations identify specific areas of improvement that may alleviate some of the interaction issues. The intent of these recommendations is to do the following:

- ◆ Clarify IOOS roles and responsibilities
- ◆ Provide focus for the investment process by further defining the NOAA IOOS requirements
- ◆ Improve the ability of the NOAA IOOS Program to obtain program funding
- ◆ Enhance the IOOS Program's communication.

We identified recommendations that might be pursued within each of the business model components. These recommendations are largely independent of one another, which will enable the NOAA IOOS Program to select those that are most appropriate, given its current operating environment, funding level, personnel, and IOOS implementation requirements.

Strategy

The NOAA IOOS Program strategic plan is a good first step to the definition of a way ahead for NOAA and regional development of IOOS. It provides a sound foundation to support the further definition of the implementation activities that will drive IOOS development. Some minor changes could refine the alignment of the strategic plan to the NOAA-Regional business model, but none are significant enough to warrant an immediate revision of the plan.

We recommend that the NOAA IOOS Program continue to use its current strategic plan as a basis for IOOS development.

IOOS Organizational Structure

The IWGOO, Ocean.US, and the NOAA IOOS Program are the organizations assigned responsibility for IOOS planning. Our findings indicated that this multi-organization leadership model has created some confusion within the regions regarding which organization's guidance to follow. For example, Ocean.US has instructed each regional group to seek certification in order to be eligible for funding to design, implement, operate, and improve sustained RCOOSs as part of the U.S. IOOS. NOAA, on the other hand, has chosen not to pursue certification of the regional associations. The conflicting instructions have made it difficult for the regions to plan.

We recommend the following actions to improve the IOOS organizational structure:

- ◆ Increase national IOOS interagency coordination
- ◆ Clarify regional IOOS investment process roles
- ◆ Designate a NOAA IOOS Program staff member to coordinate technical development of regional IOOS
- ◆ Establish a regional IOOS advisory body.

INCREASE NATIONAL IOOS INTERAGENCY COORDINATION

Description. Limited coordination between IOOS national leadership organizations (NOAA IOOS, and Ocean.US) has created confusion about regional IOOS development priorities and objectives. To ensure that NFRA and the RAs receive consistent guidance on IOOS development priorities, increased coordination between NOAA, which provides funding for IOOS development activities, and the interagency planning office is required.

Key Characteristics and Benefits. Improved coordination will clarify the roles and responsibilities associated with regional IOOS planning. The regions will better able to focus their planning efforts if they receive consistent guidance, preferably from a single organization. Coordination with the interagency planning office should support developing this consistency.¹ The remaining recommendations for the NOAA-Regional business model establish a sufficient framework to guide regional IOOS development provided the policy guidance is consistent.

Affected Stakeholders. IWGOO, federal IOOS partners, Ocean.US, NOAA IOOS Program, RAs.

Implementation Challenges. The IWGOO has undertaken a restructuring of the interagency planning office. While obtaining interagency agreement on the roles and responsibilities for regional IOOS development may be difficult pending completion of this restructuring effort, the restructuring provides an opportunity for the NOAA IOOS Program to work with Ocean.US to establish a framework for providing consistent guidance for regional IOOS development.

An alternative considered by LMI was the designation of the NOAA IOOS Program as the single lead for planning regional IOOS development. Authority to assign IOOS responsibilities resides with the IWGOO and the Interagency Committee on Ocean Science and Resource Management. To establish the IOOS pro-

¹ The required level of coordination is highlighted by the current draft of the IWGOO strategic plan, which includes an action to “obtain agreement between Ocean.US and the National Federation of Regional Associations (NFRA) on critical roles and responsibilities of the federal and non-federal regional implementation entities. The Interagency Committee on Ocean Science and Resource Management (ICOSRMI) is the federal approving authority for this agreement.”

gram as the single lead for regional IOOS development would require extensive deliberations with IWGOO, Ocean.US, and the NOAA IOOS Program before a decision could be made. In view of the pending resolution of IWGOO's 6-month effort to address the role of the current IWGOO interagency planning office, it is premature to initiate another interagency process review for ocean observation planning efforts. Therefore, LMI recommends that IOOS and its partners give the current interagency review process a chance to succeed before requesting designation as the single authority for directing regional IOOS development. If coordination with the interagency planning office is not successful in achieving consistent guidance for regional IOOS development, the NOAA IOOS Program should request authority, through the interagency process, to be designated as the single authority for directing regional IOOS development.

CLARIFY REGIONAL IOOS INVESTMENT PROCESS ROLES

Description. The NOAA IOOS Program should reevaluate and clarify the regional IOOS investment process roles to ensure that that NOAA can execute an efficient and compliant cooperative agreement process and the regions continue to receive the support necessary to operate under this process. Such a reevaluation is consistent with CSC's expressed desire to divest IOOS support responsibilities.

Key Characteristics and Benefits. The NOAA IOOS program should catalogue the current regional IOOS investment process roles currently performed by CSC to establish a functional baseline for a regional support organization (RSO). The NOAA IOOS Program can then address the resources and proper organization to execute these functions. A comprehensive assessment of the functions and resource requirements will mitigate transition challenges of establishing another RSO or realigning program office resources to assume regional support responsibilities.

Affected Stakeholders. NOAA IOOS, CSC, the designated RSO, the RAs, and NFRA

Implementation Challenges. The current NOAA IOOS Program organizational structure is not designed to administer a multi-million dollar cooperative agreement process out of the headquarters office. This office will require significant structural changes if it is to assume CSC's regional support responsibilities "in house." If the NOAA IOOS Program can identify an appropriate alternate execution agent for RSO functions, the program may reduce transition costs through economies of scale. However, any new partner will take additional time and resources to acclimate to the process. CSC has a long history with regional IOOS, and its divestment of IOOS cooperative agreement responsibilities may result in a loss of this experience.

DESIGNATE A MEMBER OF THE NOAA IOOS PROGRAM STAFF TO COORDINATE TECHNICAL DEVELOPMENT OF REGIONAL IOOS

Description. The IOOS Program should assign an individual to direct technical coordination of regional IOOS development activities. This function is not currently performed by program personnel.

Key Characteristics and Benefits. The IOOS Program's technical development coordinator would help ensure that development of regional IOOS technology, products, and services is consistent with the national IOOS and supports national IOOS development requirements or regional end-user needs. The benefit of this recommendation is that it helps to facilitate the technical development activities, which are at the core of IOOS. It will allow for a greater level of ongoing interaction with the regions as they execute IOOS development projects and will provide the IOOS Program with the specific technical information it needs to generate selection criteria and performance metrics for the investment process. In addition, the information collected through the technical development activities will support the IOOS Program's PPBE efforts.

Affected Stakeholders. NOAA IOOS Program, CSC, RAs.

Implementation Challenges. The IOOS Program must balance national oversight and coordination resource requirements with the allocation of resources for distributed implementation. Ideally, this technical coordination function would be addressed through existing resources. However, the IOOS Program is not yet fully staffed, making assignment of additional duties a challenge. This function could be assumed by other IOOS-related offices which maintain close coordination with the IOOS Program. If this is not feasible, then the IOOS Program must review its structure and priorities to ensure this essential activity can be performed.

ESTABLISH A REGIONAL IOOS ADVISORY BODY

Description. The NOAA IOOS Program should establish an advisory body to provide insight into regional end-user priorities and IOOS technical development risks and opportunities. Many federal research programs have advisory bodies, with varying placement, advisory relationships, and funding arrangements.

Key Characteristics and Benefits. An IOOS advisory body could help provide technical insight—to the IOOS Program and to NFRA—needed for making decision about IOOS development. Such a body also could help facilitate the collaboration among NOAA, NFRA and the regions. Within NOAA, NEXRAD has a technical advisory committee to review the program and determine technical needs. NOAA Climate, OCO, also utilizes a technical advisory body, which is made up of experts from three countries. Advisory bodies can be used to assist with priority setting and technical evaluations, as well as to provide strategic guidance. Given the broad IOOS stakeholder base, the NOAA IOOS Program

could benefit from establishing an advisory board that could help support the technical decision-making process.

Affected Stakeholders. NOAA IOOS Program, CSC, NRFA, and the RAs

Implementation Challenges. Advisory bodies require time and resource support, and can pose the challenge of conflicting guidance if multiple bodies offer advice on the same functional areas. The Ocean Research and Resources Advisory Panel (ORRAP) has recently established an Ocean Observations sub-panel. Before attempting to establish an additional advisory body, the IOOS Program should monitor the activities of ORRAP Ocean Observations sub-panel to determine if this body can provide the benefits noted above.

Our research findings show that if a new body is required and its role and conduct are properly structured, this type of advisory body could be established without invoking Federal Advisory Committee Act (FACA) applicability. FACA would apply only if the group were to become static or if it were expected to provide consensus advice or recommendations resulting from group deliberations or interactions. Before establishing an advisory body, the NOAA IOOS Program should seek guidance from the NOAA General Counsel to determine specific constraints in the context of the desired functions of the body. Given the far-reaching nature of the IOOS Program, and the unlikely event that all stakeholders can be represented on a single board, it is likely that the membership of the body will need to allow for rotation of members through the development life cycle.

Requirements and Implementation Plans

A detailed requirements and implementation plan do not exist to guide regional IOOS development. The foundational documents and the NOAA IOOS Strategic Plan are primary sources of guidance but do not identify specific development activities or responsibilities at the level of detail necessary for the RAs to focus their planning and development efforts, or for NOAA to provide specific guidance (or selection criteria) in FFO announcements. Further clarification of how the regions' activities should integrate with larger NOAA activities and assignment of specific development activities to the regions will allow the regions to more closely align their operations with those of NOAA IOOS.

To improve this component of the IOOS business model, we recommend the following:

- ◆ Develop a NOAA IOOS implementation plan
- ◆ Develop detailed regional implementation requirements to support regional proposal development.

DEVELOP A NOAA IOOS IMPLEMENTATION PLAN

Description. The current strategic plan outlines the goals, objectives and activities associated with the development of NOAA IOOS. Similarly, the Ocean.US IOOS development plan provides high-level requirements. These and similar documents describe the actions that need to be taken, but they do not describe who is responsible for these actions, what the relative priority of the actions is, or when the actions should be completed. Without this level of detail, IOOS stakeholders, including the RAs, cannot determine how best to support the IOOS Program.

Key Characteristics and Benefits. This recommendation will entail collective development of a more detailed plan to describe how the regions fit into the larger IOOS development picture. This description should include a definition of the steps required to complete the activities outlined in the NOAA IOOS strategic plan and the IOOS development plan; it also should define roles and responsibilities, as well as expected outcomes. Regional activity and role definition will enable the regions to do more effective long-range planning and will help ensure the alignment of the regions' IOOS development activities with NOAA IOOS requirements.

Affected Stakeholders. NOAA IOOS Program, RAs.

Implementation Challenges. The primary implementation challenge for this recommendation is the lack of detailed requirements for IOOS. A full set of detailed IOOS DMAC requirements is not expected until FY10. Detailed observation system requirements for national IOOS require completion of an analysis of the current observing system capability in the context of end-user requirements and assessment of how to best fill the capability gaps. However, with the continual funding of regional IOOS development, better definition of regional roles and responsibilities will help create a common understanding of NOAA expectations for the regions.

DEVELOP DETAILED NATIONAL IMPLEMENTATION REQUIREMENTS TO SUPPORT REGIONAL PROPOSAL DEVELOPMENT

Description. To ensure that regional development activities produce the types of products that will support IOOS, NOAA, with assistance from the RAs, must define specific requirements to identify the capabilities the regions need to provide to support national IOOS. Without requirements, it is likely that regional development will be done differently by each of the regional organizations, which could hinder efforts to integrate the systems once complete.

Key Characteristics and Benefits. National development requirements for the regions will allow the regions to factor NOAA IOOS needs into their planning activities, which are now primarily driven by the needs of regional end users. Requirements will enhance the quality of FFO proposals by allowing the regions to provide more detail on how they could support the development of IOOS. This

will also provide more detailed information to FFO proposal reviewers and help them ensure that the right proposals are selected.

Affected Stakeholders. NOAA IOOS Program and the RAs.

Implementation Challenges. As with the implementation planning recommendation, the primary implementation challenge for this recommendation is the lack of detailed requirements for IOOS. However, the regions need more specific direction to guide their planning and development efforts. Pending the completion of an IOOS implementation plan, the NOAA IOOS Program can provide requirements based on lessons learned from the DIF initiative and in support of priority NOAA IOOS national applications, including harmful algal bloom forecasts, integrated ecosystem assessments, coastal inundation prediction, and national surface current measurement capability. In addition, in coordination with other NOAA programs, the IOOS Program can identify other NOAA capabilities that would benefit by complementary or supplementary regional development activities. Implementation planning must also take regional user requirements and conceptual designs developed by the RAs into account.

Funding

The NOAA financial management system has a single budget funding line for regional IOOS development; a portion of the funding is directed to NFRA for RA coordination, and the balance supports RCOOS development. Further definition and tracking of regional funding allocations could enhance the visibility of regional IOOS activities within the PPBE process and could help diminish year-to-year funding variability.

We recommend the following:

- ◆ Establish separate program line items for regional coordination, sustainment, and development
- ◆ Leverage regional performance data to support PPBE product development.

ESTABLISH SEPARATE PROGRAM LINE ITEMS FOR REGIONAL COORDINATION, SUSTAINMENT, AND DEVELOPMENT

Description. Establishing separate program line items would more clearly delineate the funding areas associated with regional IOOS efforts and would align the funding lines with the funding categories used when the funds are distributed.

Key Characteristics and Benefits. This recommendation would improve the IOOS Program's ability to track the assignment of regional funds and would identify the IOOS components to external viewers. This recommendation will also support the articulation of the regional requirement during the PPBE process.

Affected Stakeholders. NOAA IOOS Program.

Implementation Challenges. No known implementation challenges are associated with this recommendation. The risk associated with this recommendation is that if components of a subdivided regional funding line were not allocated funding through the NOAA, OMB, or congressional appropriation process, then funding for that activity would terminate. This risk should be further evaluated during the implementation phase to determine if the separate program lines should be used solely for program development or if they should be incorporated into NOAA's budget submission.

LEVERAGE REGIONAL PERFORMANCE DATA TO SUPPORT PPBE PRODUCT DEVELOPMENT

Description. Demonstrated return on investment from regional IOOS development activities would be useful in making the case to support IOOS funding requirements. Currently, the regional performance data collected during the cooperative agreement execution phase is limited and is not being used to effectively contribute to the PPBE process. Because the PPBE process requires quantifiable output metrics to support funding decisions, regional performance data, at this point, cannot provide the "proof of value" needed to justify IOOS development funding. The content of the current progress reports is activity focused and does not provide any quantitative estimates of value generation.

Key Characteristics and Benefits. Regional performance information can provide valuable detailed data about the work being performed in the regions and about the progress being made in regional IOOS implementation. Because development of other NOAA IOOS components will lag regional IOOS development, regional data would be useful for illustrating IOOS successes during the PPBE process.

Affected Stakeholders. NOAA IOOS Program, the RSO, and the RAs.

Implementation Challenges. Implementation of this recommendation will require the establishment of national development requirements that can be used to assess regional performance. In the absence of national IOOS development requirements, the FFO announcement can address specific project performance goals. In addition, target performance levels for existing observing systems can be established through funding mechanisms that support continuing observing system operations. In the short term, this action may require the regions who want increased IOOS funding to provide performance data not currently specified in existing cooperative agreements. The IOOS Program has implemented regional status assessments. This process can be refined over time to assist in developing regional performance monitoring processes and performance information.

Communication

Communication is the foundation of the business model; it facilitates productive interactions among the components. The NOAA IOOS Program is in the process of developing a communication plan.

To improve the communication component of the business model, we recommend that the NOAA IOOS Program develop a comprehensive, long-range communication plan.

Description. A detailed communication plan would facilitate IOOS information sharing between the NOAA IOOS Program and its stakeholders. With a distributed implementation approach to IOOS development, communication is critical to keeping all stakeholders informed about IOOS, along with its progress and future plans. However, different stakeholders have different information needs. A collaboratively developed communication plan will help the NOAA IOOS Program better understand stakeholder communication requirements and will position the IOOS Program to enhance IOOS development by addressing these requirements.

Key Characteristics and Benefits. The communication plan should identify key information to be delivered, the delivery time frame, and the audience to which it should be delivered. These pieces of information will allow the NOAA IOOS Program to integrate the communication delivery schedule with the implementation schedule to help ensure that the information delivered is timely and appropriate for the intended audience.

Affected Stakeholders. NOAA IOOS Program, IOOS-related NOAA program offices, NFRA, RAs.

Implementation Challenges. No known implementation challenges are associated with this recommendation. The communication plan can be developed separate from implementation planning activities, and it can be integrated once the implementation plan is developed.

INVESTMENT PROCESSES

Our recommendations concerning this component of the business model involve changes to one or more of the investment processes: plan, select, control, and evaluate. Together, the four phases create and document the value of investments to the end users. The intent of our recommendations is to do the following:

- ◆ Establish a process to support sustained management of regional observing systems
- ◆ Develop a common set of performance goals and measures with NOAA IOOS and other federal and regional partners

-
- ◆ Enable RAs to obtain clear, consistent, and focused guidance about national needs, approaches to meeting those needs, reporting criteria, and ways to capture socioeconomic data.

Implementing these recommendations alone will not fully address all of the NOAA and RA objectives. Achieving meaningful improvement of the investment processes will require the NOAA Program to also address the weaknesses in the business model's high-level components, which guide the investment process. Otherwise, the NOAA Program risks having efficient investment processes that produce outcomes that are not aligned with organizational goals and objectives.

Plan Phase

In the planning phase, an organization identifies and provides guidance on its mission and strategic priorities. IOOS's distributed implementation approach means that planning occurs at multiple levels, including the NOAA IOOS Program and the regional partners. There is overlap between the requirements and implementation planning component of the high-level business model and the investment process planning phase. To improve the IOOS planning phase, LMI recommends aligning investment planning with IOOS needs.

Description. The NOAA IOOS Program should establish clearly and narrowly defined objectives for the regional IOOS project solicitation process based on national IOOS requirements and local user needs.

Key Characteristics and Benefits. The NOAA IOOS Program should develop procedures for ensuring that investments in the regions meet the ongoing and future needs of national and local users and NOAA. Regional investments should tightly align with the needs of national and local end users, providing support for highly visible core business processes. These strategically aligned regional investments will provide the highest value and the most obvious investment benefit to NOAA and will be the most likely to produce demonstrable returns on investment.

To achieve such a robust level of support, NOAA must continually review the business need (national and local users) for its regional investments. Periodic identification of the business need ensures that NOAA's planning process funds the projects that directly support the business need. NOAA communicates specific business needs through the FFO announcement and the cooperative agreement evaluation criteria (technical evaluation criteria). For instance, the technical evaluation criteria should address the proposal's ability to align with specific technical requirements. Considering the review of user needs and core strategy documents, including the NOAA IOOS strategic plan, NOAA should identify the most desired regional capabilities for further funding.

This critical process establishes a mechanism for verifying the business need (such as business requirements and rules, congressional mandates, and the national and local user needs) that drives continued support for regional investments. Ensuring that an essential link exists between NOAA’s business needs and its regional investments and that a defined partnership exists between the NOAA Program and the RAs, strengthens and institutionalizes the organization’s investment management process.

Affected Stakeholders. NOAA IOOS Program and the RSO.

Implementation Challenges. The NOAA IOOS Program will need to initiate a process to define national user needs. In view of the large number of potential beneficiaries, it will be challenging to reach consensus on prioritized user needs. Pending development of such a list, the NOAA IOOS Program should consider focusing on one or more of the IOOS national applications associated with the Data Integration Framework project. The NOAA IOOS Program will also have to periodically review key strategic documents and other legislative and NOAA corporate guidance to track NOAA’s mission needs. We anticipate, however, that this effort will create large benefits for NOAA IOOS stakeholders, partners, and clients. A clear definition of national user needs will facilitate numerous processes, including the following:

- ◆ It will be easier for the NOAA IOOS Program to develop better, more precise FFO guidance.
- ◆ The regions will be able to use “proposal time” more efficiently because they will have a defined target.
- ◆ The NOAA IOOS Program will save time during the PPBE process because investments will be mapped to national user needs, which will make the task of capturing value easier.

Select Phase

In the select phase, an organization (1) identifies and analyzes each project’s risks and returns before committing significant funds to any project and (2) selects those projects that will best support its mission needs.

To improve the IOOS select phase, we recommend establishing a disciplined selection process with clearly defined criteria.

Description. The NOAA IOOS Program and the RSO should use a well-defined and disciplined process, with clearly defined technical evaluation and source selection criteria, to select new proposals and reselect ongoing initiatives.

Key Characteristics and Benefits. Defining and implementing a selection process is a basic step toward aligning investments with goals and objectives. The key activities implemented within this critical process are (1) concurrent review of regional proposals, (2) use of defined selection criteria to analyze the proposals, and (3) decision making by executives to fund some proposals and not others.

The selection criteria should promote consistency with the evolving NOAA and IOOS enterprise and data management architectures. The NOAA IOOS Program and the RSO should require that proposals highlight how their projects will complement or supplement current IOOS capabilities, focusing on integration and avoiding duplication of existing efforts. For instance, the FY07 award to the Long Beach/Los Angeles Harbor IOOS Demonstration Project will provide much-needed wave information to a PORTS project in the area.

Although not tied to the review of individual FFO proposals, reselection of ongoing projects is a very important part of the overall annual project selection effort. If an investment is not meeting its defined goals and objectives, the NOAA IOOS Program and the RSO must decide whether to continue funding it or to allocate the resources to more promising new or continuing efforts.

Affected Stakeholders. NOAA IOOS Program, CSC, RAs.

Implementation Challenges. This recommendation has low implementation costs because CSC already administers a defined, structured process. However, documenting the enterprise architecture for NOAA and IOOS will take time. NOAA already keeps an inventory of regional observing assets. Under this recommendation, the NOAA IOOS Program would expand that inventory to include federal observing assets and information about data systems, functionality, and security. A well-documented enterprise architecture has the potential to save vast program resources by facilitating integration and preventing duplication and suboptimal investments in the context of the larger IOOS.

A major implementation challenge is that selection processes depend on some understanding of the total level of funding available. No decision to fund a project can be considered valid without considering what funds are available. It is therefore vitally important for NOAA to include procedures for project funding in the document policies and procedures for selecting regional investments.

Control Phase

In the control phase, an organization must ensure that, as projects develop and investment expenditures continue, the project continues to meet user needs at the expected levels of cost and risk. If the project is not meeting expectations or if problems have arisen, the organization must take steps to address the deficiencies. If mission needs have changed, the organization must adjust its objectives for the project and appropriately modify expected project outcomes.

For the NOAA IOOS Program's control phase, LMI recommends improving oversight of regional investments.

Description. The NOAA IOOS Program and the RSO should develop a more effective process, using defined criteria and checkpoints, for reviewing the progress of regional investments in meeting cost, schedule, risk, and benefit calculations. The IOOS Program also should establish a process for taking corrective actions when expectations are not met.

Key Characteristics and Benefits. The purpose of this critical process is to ensure that NOAA provides effective oversight for its investments. Although NOAA IOOS should not micromanage each project in order to provide effective control, it should maintain adequate oversight and observe each project's performance and progress toward meeting cost and schedule expectations as well as each project's anticipated benefits and risk exposure. The RSO should monitor project development teams to ensure that they are meeting project milestones within the agreed cost, schedule, and performance parameters. The RSO should also employ early warning systems that enable it to take corrective actions at the first sign of cost, schedule, and performance slippages.

Affected Stakeholders. NOAA IOOS Program, the RSO, and the RAs.

Implementation Challenges. The cost of this recommendation falls largely to the RAs. Regional projects, including those in a steady state (operations and maintenance), must maintain approved project management plans that include expected costs and schedule milestones and measurable risk and benefit expectations. Each project in the O&M stage should have a distinct project plan, one that is different from new investments; O&M projects typically do not have milestones and their cost structures are more predictable.

Accurate socioeconomic benefit calculations are difficult and expensive to obtain. Nonetheless, regional IOOS service and capability providers should work with local and national end users to define the benefits they receive from the regional investment.

Evaluate Phase

In the evaluate phase, actual versus expected results are compared after a project has been fully implemented. This is done to (1) assess the project's impact on mission performance, (2) identify any changes or modifications to the project that may be needed, and (3) revise the investment management process based on lessons learned.

To improve the IOOS evaluation phase, we recommend developing a process to inform high-level decision makers about the effects of investments on regional IOOS development.

Description. The NOAA IOOS Program should develop a process that provides information to high-level decision makers about the impacts and opportunities created by regional investments.

Key Characteristics and Benefits. To make good investment decisions, NOAA must be able to acquire pertinent information about each regional investment and store that information in a retrievable format, to be used in future investment decisions. During this critical process, NOAA should identify its regional investments and create a comprehensive repository of investment information. This repository can then be used to track resources and to provide insights and trends about major cost and management drivers.

The information in the repository serves to highlight lessons learned and to support current and future investment decisions. This repository can take many forms (catalog, list, IT system and software inventories, balance sheet), but regardless of form, the collection method should identify each regional investment and its associated components. An individual from the NOAA IOOS Program or the RSO should be assigned responsibility for ensuring that the investment information collected meets the needs of the larger investment management process.

Affected Stakeholders. NOAA IOOS Program, the RSO, and the RAs.

Implementation Challenges. This recommendation creates a modest cost for the NOAA IOOS Program and the RSO. A representative from the NOAA IOOS Program or the RSO would be responsible for repository content, quality, and usefulness, which would be additive to other functions. If the NOAA IOOS Program and the RSO implement the plan, select, and control phases correctly, then collecting useful information should not be onerous. Moreover, collecting this information will save NOAA IOOS Program resources while enabling NOAA to

- ◆ collect performance information during the PPBE process,
- ◆ develop plan phase guidance,
- ◆ communicate with other NOAA and federal programs (proof of good investment is a useful tool to engage other stakeholders), and
- ◆ provide lessons learned that will facilitate development of subsequent capabilities and avoid development of duplicate capabilities.

INVESTMENT FUNDING MECHANISM

Funding mechanisms are business tools used to acquire research, products, and services through contracts or to provide financial assistance through grants or cooperative agreements. To ensure that the NOAA IOOS Program achieves its goals and objectives for regional IOOS development, a funding mechanism is needed that provides the flexibility necessary to deal with emerging IOOS priorities, the

uncertainty inherent in research and development, and the business processes of the RAs, while providing NOAA the accountability necessary to achieve program outcomes. LMI recommends that the NOAA IOOS Program continue using competitive, performance-based cooperative agreements to fund the regional IOOS programs.

Description. A cooperative agreement is a legal instrument used to enter into a relationship. The principal purpose of a cooperative agreement is to transfer something of value (generally money or property) to a recipient to carry out a public purpose of support or stimulation authorized by a law of the United States. Typically, substantial interaction occurs between the funding agency and the recipient when carrying out the activity covered by the cooperative agreement.

Key Characteristics and Benefits. Cooperative agreements allow for substantial programmatic involvement by the government, including collaboration or participation by designated staff members in activities specified in the award or approval to move from one phase to another. In addition, with proper public notification, the technical evaluation and source selection criteria can be tailored to achieve desired program outcomes. According to NOAA policy on institutional awards, cooperative agreements may be awarded for 5 years plus a 5-year noncompetitive renewal. NOAA has already invested significant resources in developing the current cooperative agreement process, and the regional partners are experienced in this process.

Affected Stakeholders. NOAA IOOS Program, the RSO, NOAA Acquisition and Grants Office, the RAs.

Implementation Challenges. The NOAA IOOS Program is already using cooperative agreements so this recommendation poses no significant implementation challenges. However, the full range of government involvement allowed by cooperative agreements has not previously been exercised by the NOAA IOOS Program or CSC and will require time and training to implement. In addition, the use of more focused funding opportunities and evaluation and selection criteria increases the complexity of the FFO development process and may require additional involvement by NOAA grant professionals.

An alternative considered by LMI was for the NOAA IOOS Program to switch from cooperative agreements to performance-based acquisition contracts. With this type of funding mechanism, a federal agency generally specifies its needs in a solicitation and receives offers. After selecting the preferred offer and awarding a contract, the agency assigns a contracting officer's technical representative to oversee technical progress. The degree of involvement varies from review of reports to substantive oversight, depending on the supply or service. Contracts for support services may be awarded for up to 5 years, with opportunity for competitive renewal; research contracts may be awarded for 3 to 7 years, depending on the nature of the project and the need for review of the science or technology.

A key advantage of contracts over cooperative agreements is that the use of contracts may broaden the competitive base by attracting for-profit organizations, which do not generally participate in cooperative agreements. However, shifting from the current cooperative agreement mechanism to a contract mechanism poses significant cost, complexity, and risk challenges for the NOAA IOOS Program:

- ◆ Use of fixed-price contracts for R&D has been questioned, by both contractors and oversight organizations, largely because it can be difficult to define R&D efforts in sufficient detail to enable the contractor to accurately estimate its price. In the face of uncertainty, the contractor likely will build in a “reserve” that could cause the government to pay more than it otherwise would have under another contract type. In view of the current uncertainty about the IOOS requirements, it would be difficult to issue a fixed-price contract for RCOOS development and operation without encountering similar concerns.
- ◆ Cost-reimbursement contracts (particularly those with incentive provisions, such as award or incentive fees) can require the investment of significant time and effort by government personnel.
- ◆ Switching to acquisition contracts would be a significant departure from the regions’ current business processes and is not consistent with the view of IOOS development as a collaborative process.
- ◆ Acquisition contracts would require considerable retraining of NOAA personnel, potential retooling of processes (or introduction of new ones), and management of the change associated with such a transition. Such a change would have to consider the resource requirements of the NOAA Acquisition and Grants Office.

As the IOOS Program and associated regional organizations and capabilities become more mature, it may be appropriate to reevaluate the funding mechanism, particularly for the operations and maintenance of the regional observing systems.

SUMMARY

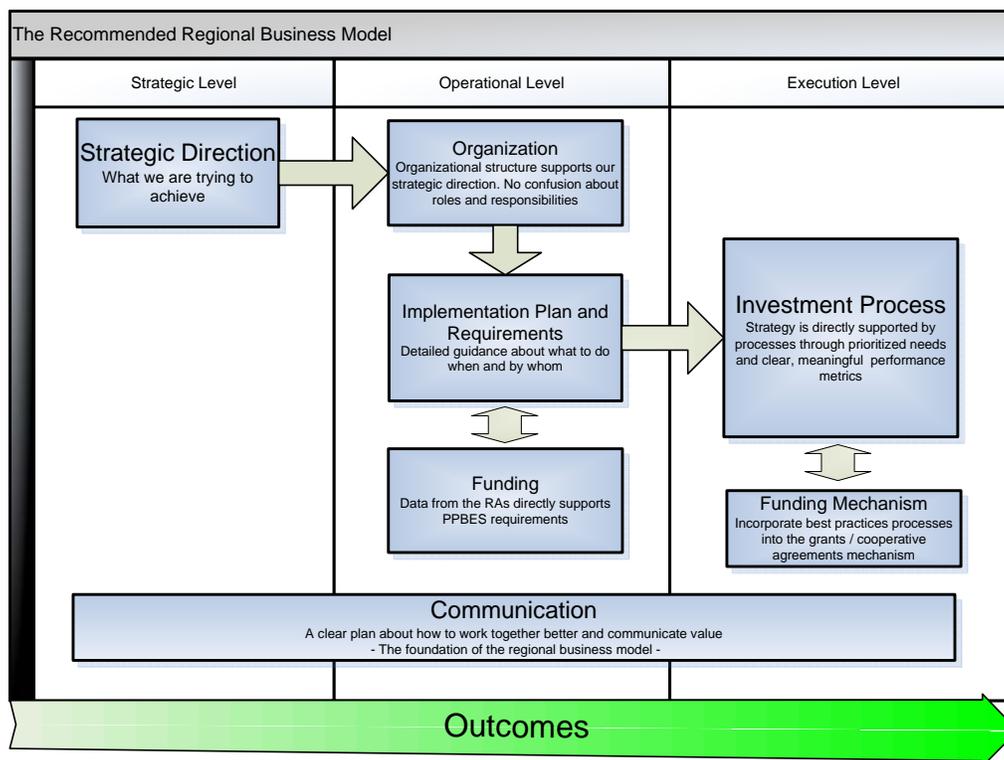
The NOAA IOOS Program can establish a more effective NOAA-Regional business model by implementing our recommended changes. A more effective business model will lead to the development and sustainment of a national network of regional observing systems that will meet both national and local needs for ocean information. As much as possible, this model meets the goals and objectives of both the IOOS Program and the RAs; minimizes implementation costs, risks, complexity, and effects on stakeholders; and conforms to OMB and GAO guidance for investment processes.

Chapter 5

Strawman Business Model: The Way Ahead

The current NOAA IOOS business model contains the basic core elements required to support the NOAA-Regional relationship. The strategy, organizational structure, and other components of the high-level business model, as well as the investment processes and the investment funding mechanism used by the NOAA IOOS Program, provide a workable framework upon which to build IOOS. In short, we do believe that the business model requires retooling. However, the NOAA IOOS Program would benefit significantly if it enhanced some of the business model components to better facilitate regional IOOS development efforts. In particular, enhancements to implementation planning and requirements and to communication offer the largest benefits. Figure 5-1 illustrates the important roles that these components play in the business model.

Figure 5-1. The Recommended Regional Business Model



This chapter presents a strawman business model—the way ahead for improving regional IOOS development. In particular, it identifies key implementation activities associated with the recommendations in Chapter 4. These activities do not constitute a full implementation plan; however, we believe that these activities will put the NOAA IOOS Program on the path toward developing and sustaining a national network of regional observing systems that will meet both national and local needs for ocean information. In addition, these activities will allow the NOAA IOOS Program to better understand the impacts of the recommended business model changes.

The strawman business model takes a holistic view of the NOAA-Regional interaction environment and targets the proposed changes on those components that will have the greatest impact on optimizing those interactions. The strawman business model does not attempt to address *all* of our findings, but it does address the root causes of the identified problems. This approach was taken to ensure that the business model components are synchronized across all of the NOAA-Regional interaction points.

HIGH-LEVEL BUSINESS MODEL COMPONENTS

The high-level business model components—strategy, organizational structure, requirements and implementation plans, funding, and communication—form the foundation for guiding development of IOOS at both the national and regional levels. The NOAA IOOS Program needs to refine or enhance some of the components to ensure that guidance is consistent and coordinated across all stakeholders. For example, the current organizational structure, with the overlapping roles of the NOAA IOOS Program and Ocean.US, has led to confusion within the regions. To address that confusion, NOAA and Ocean.US need to clarify planning roles. In particular, the NOAA IOOS Program should improve coordination of planning activities between NOAA, which provides funding for IOOS development, and Ocean.US, the interagency planning office.

A more recent organizational issue is that CSC has indicated an intention to divest numerous regional support functions. To address this situation, NOAA IOOS needs to initiate a process to identify the level of effort associated with CSC's current involvement, investigate alternative regional support organizations, and, potentially, realign program office resources to support regional investment processes directly. Addressing CSC's diminishing role quickly will ensure that existing coordination across stakeholders does not suffer.

The designation of a technical development coordinator, who could reside either in the NOAA IOOS Program or another IOOS related program, would also facilitate consistent, coordinated across IOOS stakeholders. With IOOS development taking place concurrently at the national level and in all 11 regions, such a coordinator could provide the day-to-day interaction needed to help ensure the timely resolution of development issues and sharing of program information across all of

the regions, as well as to help ensure that the cooperative agreements produce the desired technical outcomes.

Another high-level component that the NOAA IOOS Program should enhance concerns IOOS requirements and implementation plans. The NOAA IOOS strategic plan identified many of the activities required to initiate IOOS development. However, the strategic plan does not address how the activities would be performed or who would be responsible for completing them. The NOAA IOOS Program needs to develop an implementation plan that specifies the steps necessary to complete the identified activities and assigns responsibilities for their completion.

Pending development of a national IOOS implementation plan, the NOAA IOOS Program should provide the regions with specific development priorities and requirements to support investment planning. Clear regional IOOS requirements will help to focus regional development efforts and ensure that developed systems support both NOAA's needs and the needs of regional end users. With a detailed understanding of IOOS requirements, the regions will be able to propose projects that will support national IOOS capabilities. More specific requirements will also allow NOAA to monitor regional performance.

The funding component involves the NOAA PPBE process, which requires NOAA programs to demonstrate performance improvements before they can receive funding. To put it another way, because regional IOOS development will produce the earliest returns for IOOS, regional development progress and performance data should be used to strengthen the IOOS business case during the PPBE process. Performance data compiled from project reports and program reviews must be incorporated into Program Operating Plan development in order to demonstrate sufficient return on investment, which is required to warrant the allocation of resources necessary to develop desired IOOS capabilities.

The last high-level business model component that we believe requires enhancement is communication. The NOAA IOOS Program needs a communication plan that provides the road map for managing the programmatic communications to all stakeholders. The plan should identify what messages are to be delivered, when they need to be delivered, who will receive them, and what mechanism will be used to deliver them. The communication plan provides the means to coordinate all of the messages delivered by a program to ensure their consistency.

Table 5-1 lists the recommendations that we believe are most crucial for improving the high-level business model components and, for each identifies key implementation activities.

Table 5-1. Key Implementation Activities: High-Level Business Model Components

Component	Recommendation	Key implementation activities
IOOS organizational structure	Increase national IOOS interagency coordination	<p>Engage Ocean.US to identify viable alternative approaches to help deconflict regional IOOS development planning responsibilities</p> <p>Identify NOAA IOOS Program responsibilities and Ocean.US responsibilities</p> <p>Establish an ongoing coordination process</p> <p>Inform regions of new planning responsibilities</p>
	Clarify IOOS regional investment process roles	<p>Identify the regional support functions current executed by CSC</p> <p>Track CSC's decision-making about its role as the regional support organization</p> <p>Investigate the potential for other IOOS-related partners to fill the regional support office role</p>
	Designate a member of the NOAA IOOS Program staff to coordinate technical development of regional IOOS	<p>Outline areas of responsibility and identify activities to be performed, including the following:</p> <ul style="list-style-type: none"> ◆ Monitor all phases of the regional IOOS development life cycle, including project planning and requirements, development and testing, and operations and maintenance to provide detailed information for reporting project status ◆ Communicate potential technical problems to the NOAA IOOS Program as needed <p>Identify a technical development coordinator</p> <p>Introduce regional stakeholders to the newly assigned technical coordinator and describe the coordinator's role, responsibilities, and expected interactions</p>
	Establish a regional IOOS advisory body	<p>Solicit input from regional and other IOOS partners about roles and responsibilities of an advisory body</p> <p>Monitor the progress and mission of the newly formed ORRAP Sub-panel on Ocean Observing to evaluate its potential to serve as a advisory panel</p> <p>Work with the NOAA General Counsel to determine the appropriate framework for establishing the advisory body</p>

Table 5-1. Key Implementation Activities: High-Level Business Model Components

Component	Recommendation	Key implementation activities
IOOS requirements and implementation plans	Develop a NOAA IOOS implementation plan ^a	<p>Identify major components of the implementation plan, consistent with the activities outlined in the strategic plan</p> <p>Identify sources to provide information on these components</p> <p>Collect information from IOOS information sources</p> <p>Identify the requirements for regional IOOS in NOAA IOOS implementation</p> <p>Compile collected information into an integrated implementation plan</p> <p>Coordinate with the interagency planning office to ensure consistent guidance on IOOS development</p>
	Develop detailed interim implementation requirements to support regional proposal development (and inform NOAA IOOS implementation planning) ^b	<p>Identify specific regional users and other national beneficiaries of regional investment to define needs and expected outcomes</p> <p>Categorize development goals as near- and mid- term</p> <p>Identify interim NOAA-specific requirements for regional development</p> <p>Leverage regional conferences to identify regional requirements and priorities for the FFO planning year</p> <p>Use the interim NOAA IOOS and regional IOOS requirements to identify expected outcomes for the FFO planning year</p> <p>Establish a process to incorporate requirements into the FFO process</p>
Funding	Leverage regional performance data to support PPBE product development	<p>Establish and describe the types of performance and outcome measures required to show value in the PPBE process</p> <p>Require the regions to provide project performance information in their progress reports</p> <p>Incorporate mid-year regional performance data into the IOOS Program Plan</p> <p>Incorporate end-year regional performance data into the IOOS POP and Budget Narrative</p>
Communication	Develop a comprehensive, long-range regional communication plan	<p>Continue development of the NOAA IOOS communication plan</p> <p>Ensure that the plan addresses the regional component of the IOOS Program and all associated stakeholders</p> <p>Define a communication strategy for each of the stakeholder groups</p> <p>Identify a standing mechanism for regional communication, feedback, and knowledge-sharing to ensure that every region has access to the same information</p>

^a The implementation activities for this recommendation address the development of a comprehensive NOAA IOOS implementation plan and are outside the scope of the regional business model implementation plan.

^b When NOAA IOOS implementation planning is complete, these steps remain applicable without the interim caveat.

INVESTMENT PROCESSES

This component of the NOAA-Regional business model provides the primary means for directing regional IOOS development. To ensure that investment in regional development produces the outcomes that best support the national IOOS, the NOAA IOOS Program needs to refine its investment processes. For example, in the planning phase—in particular, development of the FFO announcement—the NOAA Program should incorporate a greater level of detail about IOOS requirements so that the regions can propose investments that support both the NOAA IOOS Program’s business needs and the needs of the end users in the regions.

The investment selection process should be well-defined and structured to enable selection of the project best-suited to support regional IOOS development. The current selection process provides a good start to support an enhanced investment process.

To better control regional IOOS development activities, the NOAA IOOS Program needs an effective process to review the progress of regional investments, using defined criteria and milestones to assess project cost, schedule, risk, and benefits throughout the investment period. GAO suggests that grant processes have performance accountability mechanisms that reward good performance and provide extra support and supervision to poor performers. To be effective, accountability mechanisms must be supported by a clear strategic direction and valid, useful metrics.

The evaluation phase requires specific information about the performance of each project. That information must be easily accessible and must support decisions about the project’s future. The information about all of the projects taken together will help the NOAA IOOS Program determine the impacts and opportunities created by its regional investments.

Table 5-2 lists the recommendations that we believe are most crucial for improving the NOAA IOOS investment processes and, for each identifies key implementation activities.

Table 5-2. Key Implementation Activities: Investment Processes

Phase	Recommendation	Key implementation activities
Plan	Align investment planning with IOOS needs	<p>Review lessons learned collected during the evaluation phase to identify areas in which priorities may be need to be adjusted</p> <p>Evaluate the performance of ongoing regional projects and their alignment with NOAA IOOS goals and objectives to determine if funding should be continued</p> <p>Identify priority investment areas that should be included in FFO guidance</p> <p>Establish interim requirements for each priority investment area</p> <p>Define preliminary performance metrics for each priority investment area</p> <p>Identify any investment areas in which less-established regional developers will need additional support (for example, by federal agencies or through partnership with more developed RAs) to meet requirements</p> <p>Identify FFO scope, technical evaluation, and selection criteria to be used to enable selection of an optimal mix of projects to achieve desired outcomes</p>
Select	Establish a disciplined selection process with clearly defined criteria	<p>Evaluate and score new proposals against identified evaluation criteria</p> <p>Evaluate ongoing regional investments to ensure that they still support identified priorities</p> <p>Select projects that align with identified priorities and with NOAA IOOS goals and objectives</p>
Control	Improve oversight of regional investments	<p>Initiate a iterative and collaborative process to tailor performance metrics to the individual awardees (this ensures less developed awardees will remain competitive)</p> <p>Collect mid-year performance data from RAs, including cost, schedule, benefit, and risk mitigation plans for incorporation into the IOOS Program Plan</p> <p>Collect end-year performance data from RAs, including cost, schedule, benefit, and risk mitigation plans for incorporation into the IOOS POP and Budget Narrative</p> <p>Regularly review the performance of regional investments against stated expectations</p> <p>Work with RAs to identify corrective actions to be implemented when performance does not meet expectations (this may include providing technical assistance to less mature regions to help them establish initial capabilities)</p> <p>Track regional implementation of corrective actions, when underperformance has been identified</p>

Table 5-2. Key Implementation Activities: Investment Processes

Phase	Recommendation	Key implementation activities
Evaluate	Develop a process to inform high-level decision makers about the effects of investments on regional IOOS development	<p>Use the information collected during the control phase to create a repository of regional investment information to support decision makers and IOOS developers</p> <p>Develop a standard procedure for developing, accessing, and maintaining data</p> <p>Evaluate project performance against regional requirements and performance measures, as well as factors (such as size and location of region) that may result in performance disparities</p> <p>Determine the technical feasibility of underperforming projects to determine if investment priorities should be adjusted</p> <p>Periodically review the regional investments repository to determine the ongoing value that each regional investment is providing to NOAA and its end users</p> <p>Establish a process to provide lessons learned and evaluation feedback during the next planning phase</p>

INVESTMENT FUNDING MECHANISM

The NOAA IOOS funding mechanism should provide the structure and flexibility needed to direct, monitor, and control regional IOOS development activities. We believe that in the context of the NOAA IOOS business environment, cooperative agreements are sufficiently flexible to support the research performed by the regions and can provide the structure required to support operational development.¹ For cooperative agreements to effectively achieve the desired IOOS outcomes, the NOAA IOOS Program must use focused opportunities, detailed evaluation criteria, and performance requirements and performance measures. In addition to implementing the changes in the investment process detailed above, the NOAA IOOS Program and the RSO will need to coordinate with the NOAA Acquisitions and Grants Office to develop the specific methods to focus cooperative agreements to better meet IOOS needs and incorporate aspects of the investment management process.

¹ See LMI, *Assessment of Funding Mechanisms for the NOAA Integrated Ocean Observing System Program Office*, Report NOA72T1, December 2007.

SUMMARY

By implementing the changes to the NOAA IOOS-Regional business model identified in this study, both NOAA and the regions will be more likely to achieve the IOOS objectives of establishing a national network of regional observing systems that meet both national and regional end-user needs. At the highest level, these changes are as follows:

- ◆ Align the organizational structure to provide consistent guidance
- ◆ Develop the implementation guidance necessary to supplement IOOS strategy and vision
- ◆ Establish sustained funding levels through demonstrated performance and return on investment
- ◆ Improve the investment process
- ◆ Implement the full range of selection and control tools inherent in cooperative agreements
- ◆ Establish an effective communication process that fully informs NOAA and regional IOOS participants of IOOS objectives, priorities, and lessons learned to promote alignment between the IOOS partners and across the business process.

Although more communication among the partners and with various external process owners is required to fully implement these changes, a commitment to achieve these improvements is the vital first step. Once this commitment is attained, implementation planning can proceed.

Appendix A

List of Interviewees

Table A-1 lists the names and the associated organizations of the people we interviewed for this study.

Table A-1. Interviewee Names and Associations

Name	Association
Roger Gauthier Christine Manninen	GLOS
Rick Devoe Harvey Seim Mark Luther	SECOORA
Jan Newton	NANOOS
Tom Malone	OceanUS
Stephanie Peck Eric Terrill	SCCOOS
Mike Johnson	U.S. Climate Change Program, OCO.
Rob Bassett	CO-OPS
John Trowbridge Tom Shyka	NERACOOS
Dan Henderson	NDBC
Molly McCammon	AOOS
Prof. Julio Morell Prof. Roy Watlington Dr. Jorge Corredor	CaRA
Chris Ostrander Sandy Shore Brian Taylor	PACIOOS
Gabrielle Canonico	NOAA IOOS Program Office
Worth Nowlin Ann Jochens	GCOOS
Francisco Chavez Heather Kerkering	CENCOOS
Geno Omli Mary Culver	CSC
Carolyn Thoroughgood Dave Chapman Scott Glenn	MACOORA

Appendix B

List of Documents Reviewed

Table B-1 is LMI’s “working list” of documents for this study. As we encountered important documented and materials, we recorded them in this table.

Table B-1. Materials Reviewed

Index no.	File name	Type	Description
1	Roles and Responsibilities with respect to IOOS Regional Association—merged2Mar07	Word	A very valuable document, it lists the roles and responsibilities associated with the regional business process across agencies.
2	FY07 RA Funding	Excel	Total grants funding levels for the 11 RAs and 3 pilots from FY 03 to FY07—including the name of the contracting organizations for the projects
3	FY07 Regional Funding-Risk Info26 June	PDF	A PowerPoint Presentation titled FY07 Regional IOOS: Identification of FY07 Needs, BAA Participation and Potential Outcomes. Lists the assets lost, funding levels,. Characteristics, shareholders, POCs, and Proposal Information for each of the organizations that submitted proposals
4	IOOS RA Audit-Gino- Project 19	Word	This is an audit of the FY07 process with lots of useful information, including business processes and FY07 funding numbers. It also covers the business process end of the Regional relationship. Also provides links to supporting documentation
5	RA Funding	Excel	Total grants funding levels for the 11 RAs and 3 pilots from FY 03 to FY07—including the name of the contracting organizations for the projects
6	2008 FFO Exec Sum	PDF	FY 08 Announcement of Federal Funding Opportunity
7	Panel_recs-summary	Word	Comments and recommendations from panelist on the FY07 grants process
8	08-14-07 Meeting Summary	Word	Meeting Summary of the Informal discussions between NFRA and NOAA on 8-14
9	08-14-07 NOAA Take-Aways	Word	Meeting take aways from the Informal discussions between NFRA and NOAA on 8-14
10	COTS and RA FY07 Funding Table_2007_0605	Word	COTS and RA funding numbers 03- 06
11	CSC RA Needs Assessment (project 19)	Word	A description and status report of 7 milestones of the RA funding project
12	timeline_fy08	Excel	A time table for the grants process
13	Regional Fact Sheets	PDF	Short description of the projects funded by the FY07 grants cycle
14	FY07 SeCOORA proposal documents	PDF	SeCOORA’s FY07 proposal documents: budget justifications, proposal text, CVs, etc.

Table B-1. Materials Reviewed

Index no.	File name	Type	Description
15	FY07 AOOS proposal documents	PDF	AOOS's FY07 proposal documents: budget justifications, proposal text, CVs, etc...
16	Integration of Coastal Observations and Assets in the Carolinas in Support of RCOOS Development in SECOORA–Focus Area 1.	PDF	FY07 proposal documents for the Integration of Coastal Observations and Assets in the Carolinas in Support of RCOOS Development in SECOORA Project
17	FY07 proposal for the Integration of and Regional Enhancements to the Gulf of Mexico Coastal Ocean Observing System	PDF	GCOOS FY07 proposal documents
18	FY07 Maintaining and enhancing ocean observations around Florida: Currents	PDF	FLCOOS FY07 proposal documents
19	FY07 SCCOOS Proposal	PDF	SCCOS FY07 proposal documents
20	FY07 MARCOOS Proposal	PDF	MARCOOS FY07 proposal documents
21	FY07 NANOOS Proposal	PDF	NANOOS proposal documents
22	FY07 Proposal for Developing the Hawaii-Pacific Ocean Observing and Information System	PDF	FY07 Developing the Hawaii-Pacific Ocean Observing and Information System
23	FY07 Proposal for a regional system for observations and decision support in central and northern California bays and coastal waters—"CeNCOOS Bays"	PDF	FY07 CenCOOS proposal
24	FY07 NERACOOS Proposal	PDF	FY07 NERACOOS proposal
25	FY07 GLOS Proposal	PDF	FY07 GLOS Proposal
26	RA Progress on Business Plans and Conceptual Designs	Word	A description of RA progress toward completing business plans and conceptual design studies
27	RA GOVERNANCE_2007_2009	Word	A very good description of the RAs: structure, membership, dues, etc... Put together by Molly McCammon
28	CaRa website	Web	Website for the Caribbean RA
29	AOOS Website	Web	AOOS website
30	NANOOS Website	Web	NANOOS website
31	CeNCOOS Website	Web	CeNCOOS website
32	SCCOSS Website	Web	SCCOSS Website
33	PacIOOS Website	Web	PacIOOS Website
34	GLOS Website	Web	GLOS Website
35	GCOOS Website	Web	GCOOS Website
36	SeCOORA Website	Web	SeCOORA Website
37	MACOORA Website	Web	MACOORA Website

Table B-1. Materials Reviewed

Index no.	File name	Type	Description
38	NERACOOS Website	Web	NERACOOS Website
39	GCOOS Business Plan	Web	GCOOS Business Plan
40	GLOS Business Plan	Web	GLOS Business Plan
41	SECOORA Business Plan	Web	SECOORA Business Plan
42	GoMOOS Website	Web	GoMOOS Website
43	GLOS_RA_3-9-2006	Power-Point	Brief on the great Lakes Observing System: lists potential customers, and hammers home the need to work together. A good description of the GLOS program.
44	Molly's AOOS Talk	Power-Point	Good description of the Alaska Ocean Observing System, including stakeholders, accomplishments, governance and business plan, and DMAC issues.
45	NFRA 07 Funding Critquefinal	Word	This is NFRA's critique of the FY07 grants process. They offer a lot of suggests and touch on a lot of points about the grants award process - not much about business processes
46	NFRA_GCOOS	Power-Point	General information on the Gulf of Mexico Coastal Ocean Observing System, including structure, business plan, and local requirements.
47	NFRA_RA_CaRAv2	Power-Point	General information on the Caribbean Integrated Coastal Ocean Observing System, including users and needs, contact information, and a rough development structure.
48	NFRA_RA_MACOORA 3-09-07	Power-Point	General information on the Mid-Atlantic Coastal Ocean Observing Regional Association (MACOORA) including user needs, process toward certification, and regional challenges
49	NOAA IOOS Regional Issues 7-25	Word	Summary of discussion with Z. Willis on July 24, 2007 and follow up with T/Vann on 27 July.
50	#4 RA certification of Performance	Word	Description and purpose of RA certification process
51	DRAFT Certification pos paper	Word	NFRA's position paper on how the certification process should work - based on business plans and raises some questions about legislative language
52	Geno RA Certification Point Paper	Word	Back ground on the certification process, and recommendation for NOAA about how to achieve aims of certification without legislative language by using contract mechanisms.
53	IOOS Funding scenarios-timelines_0707	Excel	Provides a timeline for the regional funding process with some scenario analysis
54	Region themed comments from strat. plan	Excel	Sections from the strategic plan that cover regions
55	FY 08 FFO 2 July FR 72-126-36244	PDF	Federal Register Announcement
56	07-13-07 CSC-HQ Meeting - DRAFT AGENDA	Word	CSC-HQ Meeting - DRAFT AGENDA
57	NOAA IOOS and CSC met on 13 July to discuss the FY07 lessons learned-csc-ss17july	Word	NOAA IOOS and CSC met on 13 July to discuss the FY07 FFO lessons learned, FY08 way ahead, upcoming meeting with NFRA, CORE, Ocean.US and Certification

Table B-1. Materials Reviewed

Index no.	File name	Type	Description
58	NOAA IOOS_Alt Models Matrix	Excel	Gina's summary of funding mechanisms (Matrix)
59	Regional needs assessments	Email	Provides a link to IOOS RA needs assessments, storm surge needs assessment, and great lakes need assessments.
60	CaRa Conceptual Design	PDF	CaRa Conceptual Design
61	AOOS Conceptual Design	PDF	AOOS Conceptual Design
62	NANOOS Conceptual Design	PDF	NANOOS Conceptual Design
63	CeNCOOS Conceptual Design	PDF	CeNCOOS Conceptual Design
64	SCCOSS Conceptual Design	PDF	SCCOSS Conceptual Design
65	PacIOOS Conceptual Design	PDF	PacIOOS Conceptual Design
66	GLOS Conceptual Design	PDF	GLOS Conceptual Design
67	GCOOS Conceptual Design	PDF	GCOOS Conceptual Design
68	SeCOORA Conceptual Design	PDF	SeCOORA Conceptual Design
69	MACOORA Conceptual Design	PDF	MACOORA Conceptual Design
70	NERACOOS Conceptual Design	PDF	NERACOOS Conceptual Design
71	CaRa FY08 proposal	PDF	CaRa FY08 proposal
72	AOOS FY08 proposal	PDF	AOOS FY08 proposal
73	NANOOS FY08 proposal	PDF	NANOOS FY08 proposal
74	CeNCOOS FY08 proposal	PDF	CeNCOOS FY08 proposal
75	SCCOSS FY08 proposal	PDF	SCCOSS FY08 proposal
76	PacIOOS FY08 proposal	PDF	PacIOOS FY08 proposal
77	GLOS FY08 proposal	PDF	GLOS FY08 proposal
78	GCOOS FY08 proposal	PDF	GCOOS FY08 proposal
79	SeCOORA FY08 proposal	PDF	SeCOORA FY08 proposal
80	MACOORA FY08 proposal	PDF	MACOORA FY08 proposal
81	NERACOOS FY08 proposal	PDF	NERACOOS FY08 proposal
82	CaRa Progress Reports	PDF	CaRa Progress Reports for all years available
83	AOOS Progress Reports	PDF	AOOS Progress Reports for all years available
84	NANOOS Progress Reports	PDF	NANOOS Progress Reports for all years available
85	CeNCOOS Progress Reports	PDF	CeNCOOS Progress Reports for all years available
86	SCCOSS Progress Reports	PDF	SCCOSS Progress Reports for all years available
87	PacIOOS Progress Reports	PDF	PacIOOS Progress Reports for all years available
88	GLOS Progress Reports	PDF	GLOS Progress Reports for all years available
89	GCOOS progress Reports	PDF	GCOOS progress Reports for all years available
90	SeCOORA Progress Reports	PDF	SeCOORA Progress Reports for all years available
91	MACOORA Progress Reports	PDF	MACOORA Progress Reports for all years available

Table B-1. Materials Reviewed

Index no.	File name	Type	Description
92	NERACOOS Progress Reports	PDF	NERACOOS Progress Reports for all years available
93	First IOOS Development Plan	PDF	Foundation document - Ocean.US planning doc.
94	Airlie House Report	DOC	Foundational Document bout regional planning
95	NOAA IOOS Strategic Plan	Web	Plan for the NOAA IOOS Program
96	Draft IWGOO Strategic plan	DOC	Draft IWGOO strategic plan
97	IWGOO Charter	DOC	IWGOO charter

Appendix C

Cooperative Agreement Process

The cooperative agreement process is the primary “process of interaction” between the NOAA IOOS Program and the RAs. Figure C-1 is a flow chart illustrating how the FY07 cooperative agreement process worked.

Figure C-1. FY07 NOAA IOOS Cooperative Agreement Process

