

**Understanding and Predicting Changes in the Workforce
For Ocean Sciences, Technology, & Operations:
Project Overview**

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Overview

Title Understanding and Predicting Changes in the Workforce for Ocean Sciences, Technology, & Operations

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Sponsor, Funding, Period

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Goals

1. Develop improved assessment of the ocean science, technology, and operations workforce
2. Anticipate future requirements for this workforce
3. Identify educational processes needed to develop this workforce

Project Site

www.marinetech.org/OSTOworkforcestudy/

Goals

- Produce a more complete description of the **present state** of the ocean science, technology, and operations (OSTO) workforce
- Anticipate **future developments** in this workforce
- Characterize the **educational programs** that will be needed to respond to those developments

Focus

1. Workforce for current and future **ocean observing systems (OOS)**
2. Related sectors of ocean economy with similar **knowledge and skill sets (KSS)**, such as:
 - a. Oil and gas industry
 - b. Telecommunications
 - c. Navigation
 - d. Hydrographic surveying
 - e. Ocean engineering
 - f. Basic and applied research

Sample Questions

1. What workforce will be needed to support the **expansion of OOS** (workforce size, composition, cost, etc.)?
2. What are the major factors that affect the **supply and demand** of OSTO workers?
3. For what OSTO occupations is it **hardest to find** qualified workers?
4. In what KSS are applicants for OSTO positions most **deficient**?
5. What **educational programs** are most effective at preparing students for the OSTO workforce?
6. What do we need to **do now** to help ensure that we have the OSTO, and especially the OOS, workforce we need in the future?

Analyses

1. Identify major **characteristics and patterns** for present OSTO workforce, including:
 - a. Education and training
 - b. Knowledge and skill sets
 - c. Salary
 - d. Geographic distribution
 - e. Demographic patterns
 - f. Temporal evolution
 - g. Supply and demand for a range of positions
2. Assess major factors determining present and future **supply of and demand for workers**
3. Estimate **future evolution** of OSTO and its workforce
4. Assess existing **educational programs**

Prior Studies

Summary of Major Findings on U.S. Scientific and Technological Workforce

Major problems in **educating, recruiting, and retaining** U.S. workers for scientific, technological, and operational careers

Especially critical problems in **rapidly evolving fields** (e.g., ocean exploration, engineering, and the management and use of ocean resources)

Difficult to **predict** supply of and demand for workers.

Prior Studies

Examples of MATE Center Findings

1. **Working conditions** and remote work settings make recruitment and retention difficult.
2. Positions most difficult to fill require KSS in **electronics**.
3. Technicians with **Navy** education and experience especially sought after.
4. High school and college **preparation** in math, science, and technology inadequate for employer needs.
5. Many employers provide **supplemental** education and training.
6. Acute **recruitment** problems in: (a) ROV design, development, and operation; (b) hydrographic surveying; (c) microbial taxonomists.
7. Many OSTO employers **compete** for workers with IT employers.
8. Research and environmental management employers find it difficult to compete with **oil and gas employers**.

Prior Studies

Examples of U. Mass Findings (May 2005)

1. **Greatest concerns** of New England marine science technology industry:
 - a. Lack of labor with required skills/expertise (74%)
 - b. Engineers (53%)
 - c. Technicians (45%)

2. The **least difficult positions** to fill included:
 - a. Scientists (25%)
 - b. Managers (33%)

3. Problems with **recruiting** employees:
 - a. Rural locations
 - b. Cost of living in urban areas

Factors Affecting Supply and Demand for OOS Workers

1. Inadequate / incorrect **understanding** of OOS occupations by educators and potential employees
2. Lack of **classification** of OSTO occupations by DOL
3. Poorly documented **KSS**
4. Less than optimal **educational programs**
5. **Work conditions** (e.g., time away from home, professional development opportunities, job security)
6. **Funding** for OOS
7. **Alternative occupations**
8. Financial status of industry **competitors**
9. **Macroeconomics**

Data and Methods

1. Data sets and analyses:

- a. Existing data sets and analyses (e.g., from MATE, DOL)
- b. Data sets and analyses developed in this project

2. Data collection methods:

- a. Online workforce surveys (CEOs, supervisors, employees)
- b. Focus groups to define several key occupations in detail
- c. Workshops on:
 1. present and future workforce
 2. educational needs and best practices

3. Workforce comparisons:

- a. OSTO and similar non-oceanic fields (e.g., other Earth observing systems, GIS)
- b. Comparisons →
 1. Improved analysis and prediction of OSTO workforce
 2. Identification of effective practices for OSTO education

4. Coordination and collaboration with related efforts (DOL, GIS workforce studies, ORRAP, NOAA, Navy, etc.)

Pilot OOS Supervisor Survey

<p>A. Design, Operation, and Maintenance of Facilities, Platforms, and Instrumentation</p>	<p>B. Analysis, Modeling, Forecasting, and Interpretation of Ocean Information</p>
<p>A1 - Divers and support personnel A2 - Engineer – Electrical A3 -Engineer – Mechanical A4 - Engineer – Structural A5 - Machinist/Welder/Fabricator/Carpenter A6 - Ship Officer A7- Ship Crew A8- Technician – Electronics A9 - Technician – Hydraulic A10 - Technician - Marine A11 - Technician - Marine Electronics A12 - Technician – Remote sensing A13 - Underwater vehicle pilot/technician</p>	<p>B1 - Scientist - Biological B2 - Scientist - Chemical Oceanographer B3 - Scientist - Hydrologist B4 - Scientist - Geologist/Geophysics B5 - Scientist - Meteorologist/Atmospheric B6 - Scientist - Physical Oceanographer B7 - Environmental Modeler/Forecaster B8 - GIS Analyst/Technician B9 - Remote Sensing Analyst/Technician B10 - Resource Manager B11-16 - Science Technicians B17 – Project Manager</p>
<p>C. Data and Information Management</p>	<p>D. Education, Outreach, and Applications</p>
<p>C1 - Computer Programmer C2 - Computer Software Engineer C3 - Database Administrator C4 - Information Technology Manager C5 - Network Systems Analyst C6 - Webmaster</p>	<p>D1 - Communications / PR Professional D2 - Education/Outreach Specialist D3 - Instructor D4 - Ocean Extension Agent</p>

Major Project Objectives

- Objective 1:** Characterize current workforce in support of OOS
→ surveys of regional OOS organizations
- Objective 2:** Characterize the current workforce in support of OSTO arenas that are similar to the OOS arena.
→ surveys of OSTO employers and employees
→ focus groups with employees
- Objective 3:** Identify the types of information required to monitor the evolution of the OSTO workforce over the next two decades, identify most probable future workforce scenarios, and design initial workforce prediction systems.
→ workshop on OSTO workforce analysis and prediction at Rutgers
- Objective 4:** Identify education and training objectives and practices that effectively address current and anticipated OSTO workforce needs.
→ workshop on OSTO workforce education at SIO

Questions for Discussion

1. What are your most pressing OSTO workforce concerns?
2. How well can you characterize your organization's workforce?
3. What would you like to know about your organization's OSTO workforce, and the OSTO workforce in general?
4. In what OSTO-related fields is your organization currently experiencing difficulty in hiring people?
5. What are your organization's concerns for the future of its workforce?
6. How is your organization dealing with, or planning to deal with, its workforce challenges?
7. In what ways could the educational system help your organization better meet its workforce challenges?
8. If you were to make up a new OSTO-related certification that would positively affect a potential worker's employability, what would it be? What sort of knowledge and skills would you expect for that certification?
9. If you were to make up a new OSTO-related certification that you would encourage your employees to get, what would it be? What kinds of knowledge and skills would you expect that employee to learn?