

Platforms Engineering Strategic Planning Update

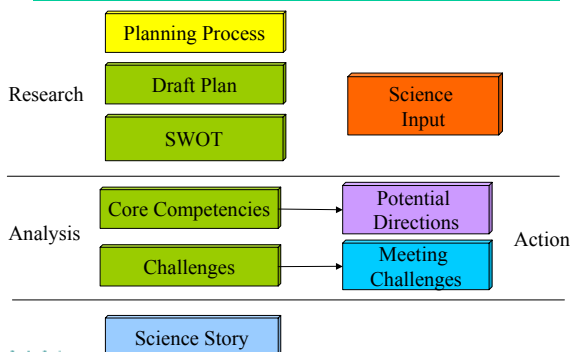


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R McEwen - E Mellinger
T O'Reilly - Y Zhang

MBARI Offsite Meeting Recap
March 21-23, 2005
Napa, CA

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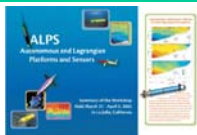
Presentation Overview



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Planning Activities

- Reading list
- SWOT analysis
- Scientist meetings
- Technology survey
- Discussions
- Draft plan



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Meetings

Held 3 meetings with MBARI Science Staff

Topics:

- Current research interests that would benefit from platform engineering development.
- Concerns related to engineering project selection and structuring at MBARI.
- Methods of improving interactions between the engineering and science divisions.



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Research Topics

- Primary Ocean Productivity (K. Johnson)
 - Drifting Profilers (Chem. Sensors on ARGOS Floats)
 - Ocean wide Coverage
- Seafloor Mapping (D. Caress)
 - Multibeam, Sub-bottom, Side-scan
 - Institute Support Necessary
- Marine Geology (Charlie Paull)
 - Flux of Fluids and Gasses Through Seafloor
 - Transport of Sediment Across Seafloor
- 2nd Meeting: Scholin, Barry



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Technological Limitations

Energy constraint

- Mobile platforms and deployed instruments are limited by energy constraints.
- Deployment Duration, Sample Rates, Communication Rates/Range, ...

Lack of measurement techniques

- Measuring number of particles in water
- No measurement techniques between bulk properties and microscopic assay
- Difficult to observe and characterize thin layers (and other morphologies) of water (layers are easiest to find)
- Chemical sample processing time

Sensor accuracy

- Sensor drift

Reliability

- Endurance of platforms/cables/instruments
- Biofouling

Size and Scale of Ocean vs available observing technology



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Concerns

- Too many projects, lack of consistent focus.
- Projects take too long, need to find the balance between immediate results and generalized utility.
- Large, engineering driven projects are susceptible to a disconnect between engineering and science.
- Concern that rush to move on to new projects may leave potential of current projects unrealized.
- Concern that new engineering thrusts may neglect importance of ROV developments.



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Improving Interactions

- Recognize range of projects that engineering participates in: Small science driven projects on one hand, major engineering initiatives on the other.
- Structure large projects with more incremental implementation steps. Don't start on these projects without refined plans that include shorter duration accomplishments.
- Involve engineering staff in traditional science cruises.
- Improve relevance of new engineering driven proposals to current science interests.



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Draft Plan

•Mission Statement

Inform and implement the development of platforms and related technologies at MBARI

•Charter

- Support MBARI's institutional mission
- Maintain a strategic plan for ocean observing platforms and technologies
- Provide expertise and guidance in platforms and related technology
 - Science, Operators, Management, Community
 - MBARI Engineering

•Composition

- Platforms Engineering representatives (5)
- Research Engineering representatives (1)
- Science representatives (?)
- Operations representatives (?)



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What is a platform?

A platform provides and manages shared resources to scientific instruments

- Multiple science users, shared resources
 - Energy
 - Physical space
 - Data storage and telemetry
 - Navigation, propulsion, location
 - Access to data
- Common interface standards
- Reconfigurable



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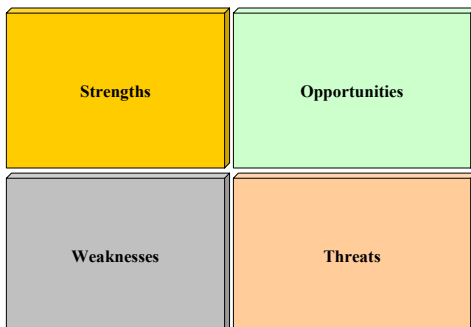
Draft Plan

- Metrics for success
 - Metrics for engineering success in MBARI strategic plan
 - Adoption of platforms technologies and standards by MBARI and community
 - Solicitation and external recognition of expertise in platforms



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SWOT



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SWOT Results

Strengths

Skill sets and experience
Deployment resources
Relatively stable funding
Access to scientists
Latitude in setting direction

Opportunities

Community initiatives
New platform types
Emerging technologies
Collaborations
Proposal process reform



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SWOT Results

Weaknesses

Understanding user needs/domains
Diversity of stakeholder needs/agendas
Resource issues

- Fixed size and composition of core engineering
- Number of operational systems
- Limited basic research capability
- Technical support, lab space (excellent quality, need more)

Nature of platforms

- Technology push more than science pull
- Long, expensive, high risk development cycles



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Environmental Survey Results

Weaknesses

Skills Related

- Science literacy (hotly debated)

Tracking tech/science trends
Project Management

- Quantitative comparison of platforms: economics, science value



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Environmental Survey Results

Threats

- Rapid changes in technology and science
- Mis-alignment with Packard Foundation values
- Wider restrictions within marine sanctuary
- Competition
 - Institutional
 - Private sector



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Core Competencies

- Systems architecture and integration
- Structural mechanical design
- Vehicles (operational systems)
- Power systems
- Application layer software
- Embedded software
- Control systems
- Hydrodynamics
- Vehicle dynamics
- Field experience in ocean engineering – designing things for the real world



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Playing to Strengths

- High risk projects (difficult to get initial funding)
- Long cycle projects with intermediate science opportunities
- Design for technology transfer
 - Lower barriers to adoption, operation, adaptation
 - Requires investment in engineering, tooling, documentation
- Highly robust systems
 - Grand Challenge: Long maintenance-free deployments
- Low-impact/green engineering
- Deep ocean systems
- Science literacy/specialization



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Next Steps

- Determine structure of council and its interfaces
- Bring groups, science, operations into council
- Coordinate with other groups to make a single roadmap
- Gather more strategic information
 - Science input
 - Operations input
 - Technology Survey
 - Review of previous projects
 - Identify technology limits, common threads



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Next Steps

- Connections with science
 - Cruise participation
 - Lab Leads
 - Oceanography 101
- Project Execution
 - Creating and maintaining science buy-in
 - Intermediate science opportunities in projects
- Work on systems engineering processes
- Proposal process
 - Evaluating opportunities: economics, science impact
 - Influencing Proposals: before, during and after proposal process
 - Number of projects



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For Review

- Planning materials on Project Library



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