Science Management and Informing Decision Making

Example - Profile Analysis

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Systemic Assessments

- Coordinate trans-NIH level required reporting

- Respond, and ensure compliance, to federally-mandated performance reporting mechanisms
  - Government Performance Results Act (GPRA)
  - Program Assessment Rating Tool (PART)

- Foster development of more appropriate assessments for
  - Innovative science assessments
  - Large complex systems/Organization assessments

- Facilitate Science of Science Management activities
Challenges for Science Managers

- Uncertain pathways, timeframes, or products to develop science advances
- Differences across spectrum of research (ex. discovery vs. translational) to move science from bench to bedside
- Multiple modes of research (high reward / high risk, innovative, large multi-part initiatives) to foster the best science
Current Environment

- Science managers must make decisions to select / guide research
- Many choices, often lack tested evidence
- Resource and budget constraints limit activities
- Growing accountability for actions and results, but appropriate assessment lags
Current Practices

- Customary / Historic practices
- Pressure / Persuasion
- Desire for acceptance / likeability
- Imitation of outside practices
- Directives
Possible Alternatives

- Need systematic approaches
  - Appropriate results
  - Tested evidence
  - Credible data
- Always combined with judgment
What is the issue?

Knowledge is lacking on how to best manage the breadth of science research.
Systematic Field of Study

Science of Science Management

A process:

• To understand federal stewardship

• To foster the innovative use of resources for planning, conducting and disseminating scientific research

• To inform decision-making

That enhances science productivity and improves public health
Possible Theoretical Approaches

- Wholey approach
  - How to inform management?
  - How to support evidence-based decision making?

- Program Theory approach
  - How does science management work?
  - How to test how it works?

Need to separate tested from anecdotal, fact from fiction, and valid from customary
Possible Outcomes

- Support science management decision-makers with tested evidence
- May improve decisions versus ad hoc
- Better inform oversight and withstand scrutiny
- Systematic process to develop knowledge
Example – Selecting Scientists

- Proposals requesting funding often outweigh resources

- Committees weigh proposal and scientist to select best candidate
  - Assess the scientific merit of proposal
  - Assess scientist’s ability to complete proposal
Current Selection Practices

- Assess proposal merit
  - Scientific value of outcome
  - Feasibility of achieving outcome with stated design

- Assess scientist’s ability
  - # of publications
  - List of publications
Science Management Question

Are there attributes or characteristics of scientists that could facilitate selecting the best candidate?
Science Management Research

- Conduct a profile analysis
  - Formal summary or analysis of data representing distinctive features or characteristics of scientists

- Possible concepts
  - Total publications / Total citations
  - Impact of research (citations per publications, h-index)
  - Recent productivity
  - Normalizing across fields
  - Citation cycles / patterns
Profiling Analysis in Practice

National Institute on Drug Abuse (NIDA)
Division of Basic Neuroscience and Behavioral Research (DBNBR)

- **Data:** 430 proposals from 2006
  - Bibliometrics (# of publications, # of citations, citations per publication) for 1996-2000 and 2001-2005
  - H-Index (impact measure)
  - Proposal selection score

- **Findings**
  - *No correlation* between any bibliometric measure and scores
  - *Higher H-Index* for selected proposals vs. non-selected
Future Research

- Perform additional research on value of H-index to determine if appropriate for reviewer use
- Develop historical quasi-experiments to test validity
- Research cross-field normalizing models to support generalizability
- Study citations to identify patterns
Possible Management Impacts

- First Steps
  - Raises questions about use of only volume measures in scientist selection
  - Suggests possible value of impact measures
  - Creates evidence for science managers who determine selection policies
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Possible Applications of Theory

- Wholey
  - Provide evidence relevant to management
  - Support collection of research across organization

- Program theory
  - Question existing beliefs about assessing science and scientists
  - Test models and develop evidence

- Making spaces to support change
What is needed?

- Develop a customary practice of science management research
- Build infrastructure to conduct science management research
- Replicate research to validate and generalize findings (as in any field of research)
- Create a central repository for results and practices
- Incorporate findings into standard practices for planning and management