SAON - G7 Group of Senior Advisors (GSO)

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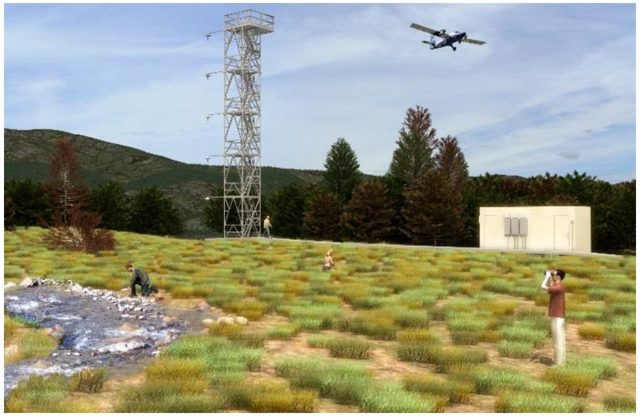
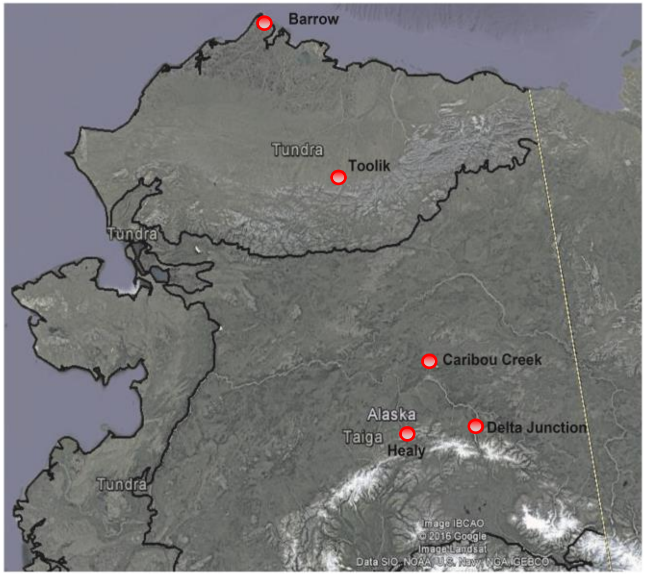
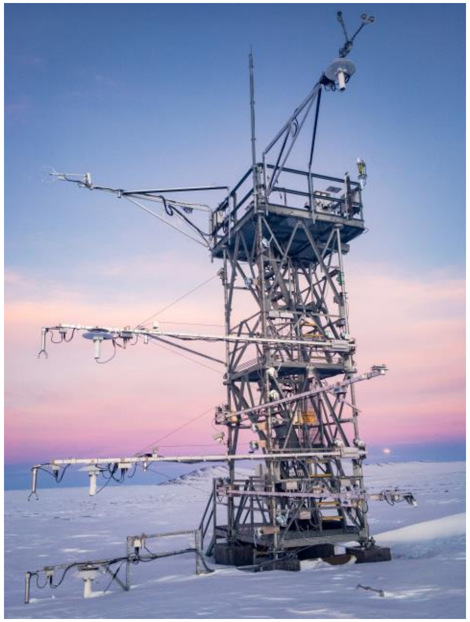
National Ecological Observatory Network

NEON is a ***Major Research Infrastructure*** that provides a highly coordinated system for monitoring a number of critical ecological properties at multiple spatial and temporal scales. The ***181 Data Products*** are derived from data collected from ***81 sites***, and an ***aerial observation*** platform, consistently at ***Continental scale*** for ***thirty years***, and are ***freely available online***.







Assumptions

- ***No two Research Infrastructures are the same***:
  - in scope, and function,
  - organizational structure,
  - operational model – or
  - political climate in which they sit.

- ***We can learn from each other's experience w/ GRIs***

- ***Doing the same thing, in the same way, will not work in work in the Future!***
  - (how we science scope, manage, and operate)

- ***Knowing what can be managed***, (and what is out of our control), and **focusing your resources on that.**

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Challenges

- **Governments / Agencies / Academicians / Public all call for more integration -- How to enable 'Transformative Science'**
- **How do we bring the NEEDS from the community into the Infrastructure?**
- **Sustainability AND Stability of Funding and Institutional Structure**
  - linked to the science requirements = long term, consistent observations)
- Ongoing challenge; ***changing the culture*** of how to use an Environmental Research Infrastructure.
- **Scientists are really poor managers!** Need to develop our skills, think outside our comfort level , and seek other partners to diversify our management portfolio.
- '**Perfection is the enemy of good enough**.' [1]

[1]Voltarie, La Bégueule", in Contes Tales, 1772

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ESFRI Annual Reports

"RIs are 'grinders' to weardown old, inefficient and isolated forms of managing research. They ***are agents for change budgets*** – particularly the operating budgets – for RIs are funded nationally rather than by the EU. ***This can lead to self-serving but short-sighted policies***: 'What's in it for me?' Harmful consequences can follow.[1]"

"One policy problem is an inherent disconnect between the construction and operational phases of RIs. ***A one-size-fits-all governance model will not work.***[1]"

"an ERA set of criteria … should include ***strategic planning and relevance,…[and] managerial quality***. The evaluation should underpin decisions on how much money they get.[1]"

"***an effort towards integration in the planning, management, and operational level***, instead of fragmentation of initiatives working around the same themes, ***should be strongly encouraged. One serious problem of the insufficiently mature proposals*** was that they ***did not have a coherent management structure***[2]"

"***Defining precisely the competences and scope*** … with respect to the project evaluation…***strengthened the process.***[3]"

[1]ESFRI, 2014 Inspiring Excellence: Research Infrastructures and the European 2020 Strategy. ec.europa.eu/research/infrastructures/pdf/esfri/publications/esfri_inspiring_excellence.pdf
[2]ESFRI ENV RWG 2008. Environmental Sciences Roadmap Working Group Report 2008 ec.europa.eu/research/infrastructures/pdf/esfri/esfri_roadmap/roadmap_2008/env_report_2008_en.pdf
[3]ESFRI 2016. Strategic Roadmap for European Infrastructures 2016. ec.europa.eu/research/infrastructures/pdf/esfri/esfri_roadmap/esfri_roadmap_2016_full.pdf

G7 Group of Senior Advisors (GSO) on Global Research Infrastructures (GRI)

- ***Coordinating Body***
- Australia, Brazil, Canada, France, Germany, India, Italy, Japan, Mexico, People's Republic of China, Russian Federation, South Africa, United Kingdom, Unites States of America and European Commission.
- Participating countries were ***represented by government officials and experts*** in the areas of international research infrastructures and international relations
- ***11th meeting of the GSO***, Tallahassee FL, High-Energy Magnetic Lab, May 19-23
- ***'Development', 'Access', Innovation', 'Open Data'***
  - Reference terms
  - ***Guidelines for Best Practices*** 'GSO Framework'
- Process***: iterative examination*** of 'Best Practices' through 'Use Cases'
  - Choose 2 - 4 Guidelines for review each meeting

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G7 GSO Guidelines

- *(structurally/organizationally)* ***Assure data access, and data quality***
- ***address the most pressing global research challenges***, i.e. those frontiers of knowledge where a global-critical-mass effort to achieve progress in Science, technology, innovation,
- ***Define project partnerships*** for effective management.
- ***Funding management.***
- ***Integrated use*** of advanced e-infrastructures,
- ***Interoperability*** of data across disciplines
- ***Monitor socio-economic impact.***

ec.europa.eu/research/infrastructures/pdf/gso_progress_report_2017.pdf

G7 Group of Senior Advisors (GSO) Tallahassee Mtg – Use Cases

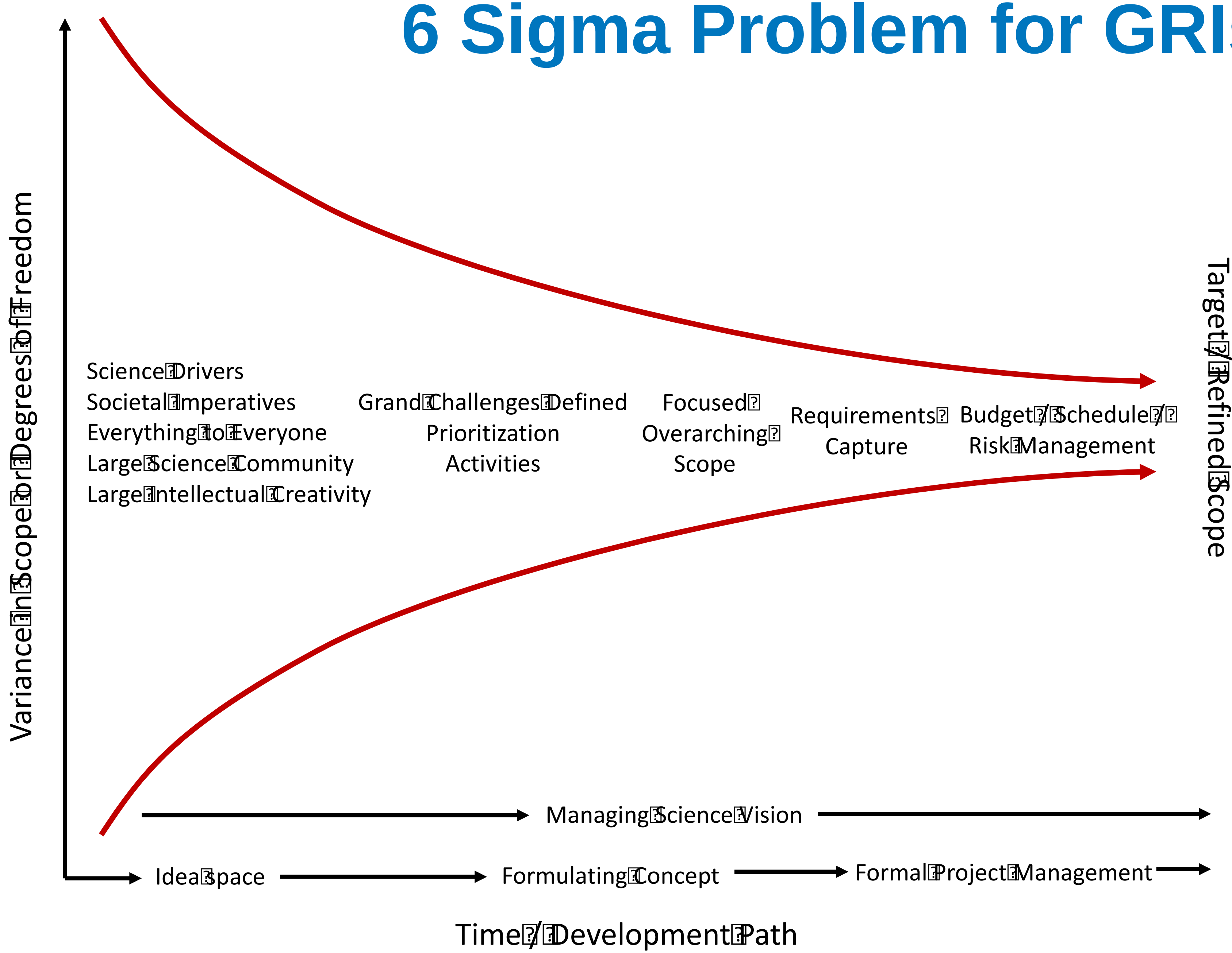
Project Management

- *Super C-Tau – Russia*
- *Long Baseline Neutrino Facility / DUNE – DOE US*
- *National Ecological Observatory Network – NSF US*

International Access

- *Nuclotron-based Ion Collider fAcility – Russia*
- *Long Baseline Neutrino Facility / DUNE – DOE US*
- *National Ecological Observatory Network – NSF US*

6 Sigma Problem for GRIs



Common ‘Near Death’ Experiences

Programmatic Immaturity

- A complex Project often lacks proper controls (scope, schedule and budget) and an underlying linear plan (cost overruns commonplace)
- Projects (transient- completion is the goal) cannot be managed like ‘Operations’ (ongoing and repetitive in nature - optimization is the goal)

Lack of rigorous change management/change control

- Re-planning / Changing the Scope places a heavy burden on leadership and erodes the focus on and respect for the science plan
- Projects constantly distracted by reinvention (scope management failure)

Culture

- Big Science (Research Infrastructure) is different from small science
- Required development teams that value affiliation (group / country success),
- Silo-ed activities
- Lacked Transparency (it’s not just your project - creation for the public)

Different approach for GRIs is needed

- Strict adherence to Project Management principles
- Reliance on systems engineering (SE)
- Blended (Agile) Project Management Approach
- Organizational Structure (Matrixed Teams)
- Change Management / Risk Management Functions
- Transparency

The degree and rigor *of which needs to be determined on* ***the project complexity and reporting requirements*** *of the sponsor*

12. International Mobility

Measures to facilitate the international mobility of scientists and engineers to participate in global research infrastructures should be promoted.

International mobility is a key element for the GRIs that allow researchers to access the GRI premises to ***run experiments***, to ***develop technologies***, and ***to spread good practices***. This is common to the UG GRI and the ESS. The IMPC provides data that are generated at local facilities. However, mobility is connected with scientific alignment at workshops and joint planning. The users are mostly users of the data, which does not imply international mobility. The CHARS has not yet developed an international mobility program or policy.

What is the core intent?

Our ***'Enabling' charge supports the notion*** of international access and mobility

'…to enable the advancement of ecological understanding and ecological forecasting'

But towards what end?, to;

- Provide international research ***access***
- ***Advance*** the frontiers of ***science***
  - implies joint research projects, exchange of ideas
- ***Share lessons learned***,
  - Optimize Operations,
  - Develop Performance Metrics
- Tackle ***Interoperability*** (what is that?)
- Develop ***person-to-person*** connections and ***trust***

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Current State of Affairs

We always recognized ***the importance of International Mobility***

- Cannot Construct/Operate NEON in a National Vacuum
- Same international user communities / same issues

No explicit support for international mobility as part of NSF Construction or Operations

- US does not have a TNA structure

Altered the text for the programmatic work that is being done among GRIs

- *Interoperability, Infrastructure-to-infrastructure activities*

NSF SAVI – EU H2020 CoopEUS/COOP+

EU EMSO, EU EPOS, EU EISCAT, EU Lifewatch, EU ICOS, EU EGI, EUdat, US AMISR, US IRIS/UNAVCO/Earthscope, US NEON, US DataOne, US OOI, Aus TERN, and others

There are many paths up the mountain but they don't all lead to the top.

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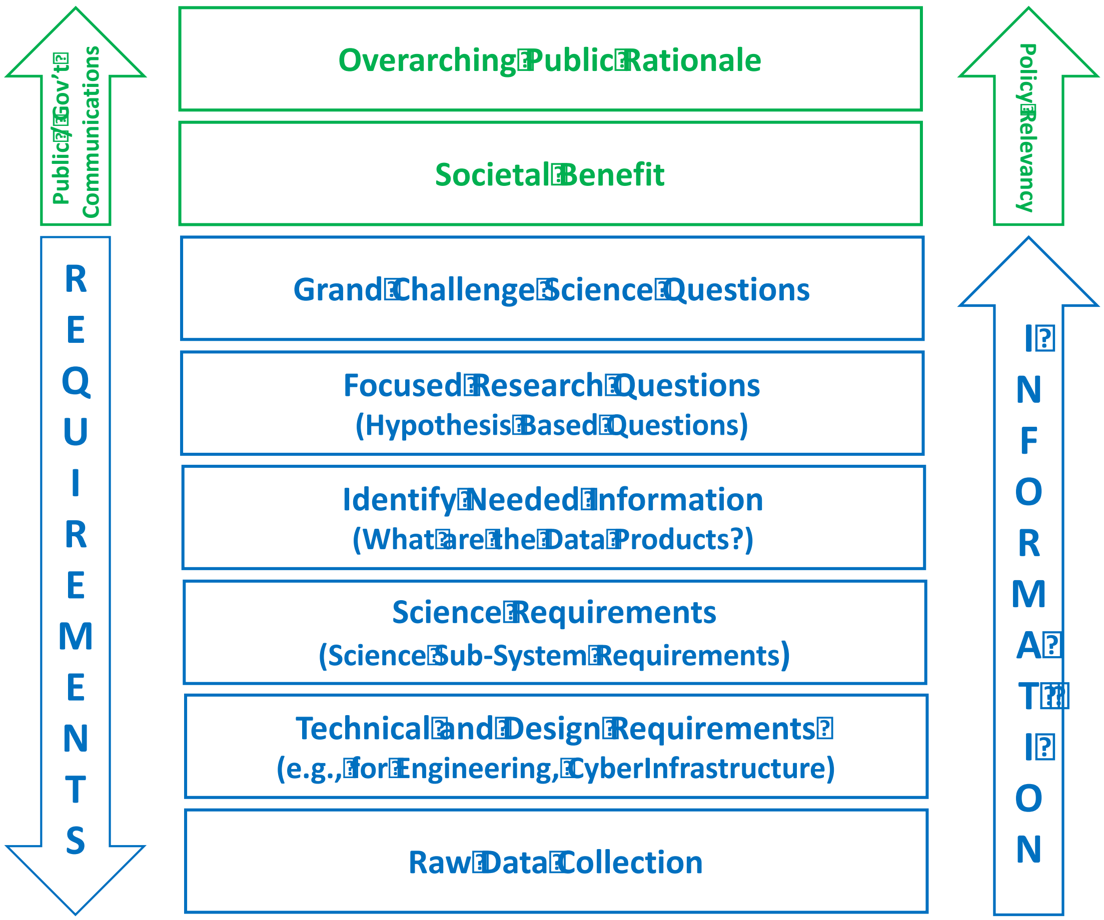
NSF Solely funded by the National Science Foundation

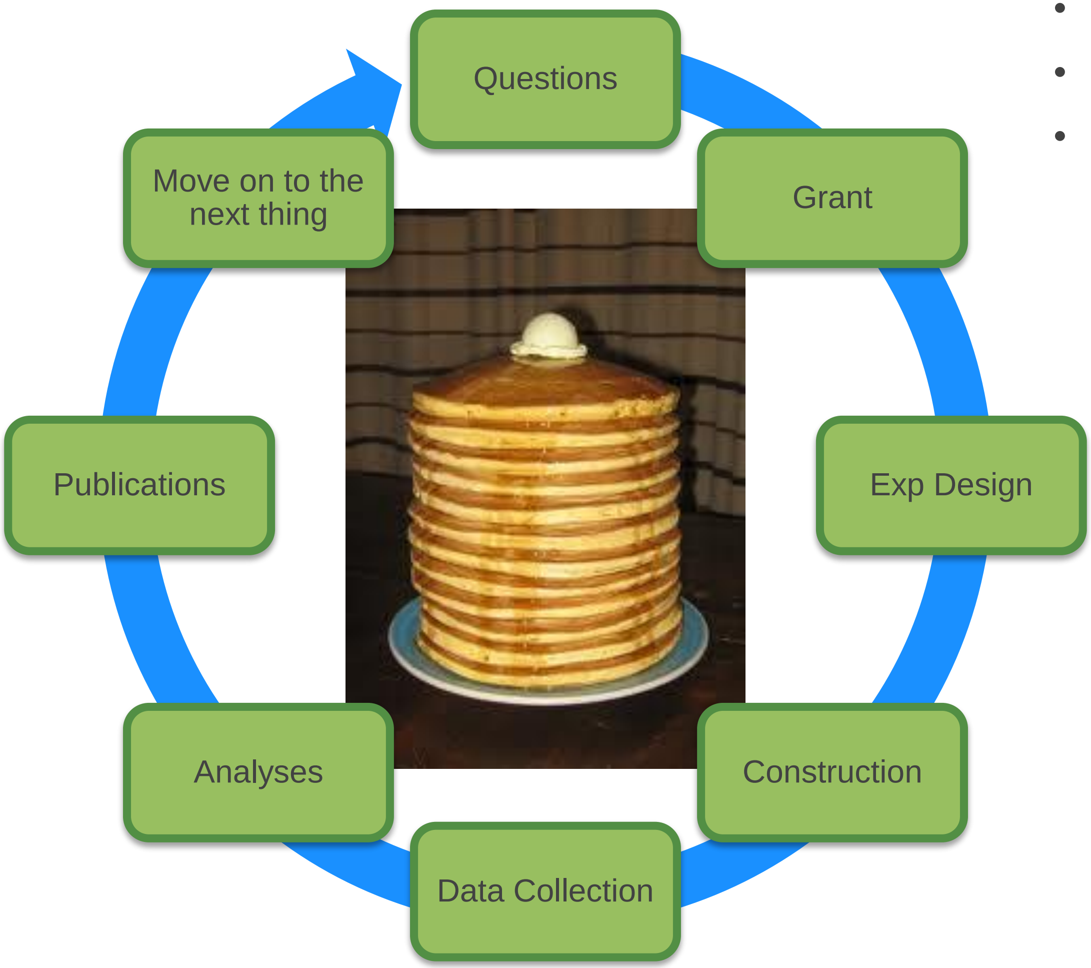
Managing Science Scope



- ***Confused understanding of*** nature, scope, goals of project (widespread)
- ***System Engineering***
- **Societal Benefits have a hierarchical association** *with GC questions and requirements*
- *Use of* **strategic Development tools** *to help define*
- *This process is* **foreign to most Scientists**
- ***Change in the narrative for Operations***

Balancing Scientific Creativity with Baseline measurements

Scientist's Approach to Project Science



- Hypotheses testing: 'what can we do?'
- Rationale for long term observations
- Capabilities-based (network development)
- Additional organizational complexity is often layered

Pro	Con	
✔		Scientific creativity
✔	✕	Comfort-level for scientists and bottom-up approaches
	✕	Complexity becomes open-ended problem
	✕	Governance is often difficult, and not extensible
	✕	Difficult planning for Program Officers/Sponsors
	✕	Problematic for long term sustainability

Balancing Scientific Creativity with Baseline measurements

Systems Engineering Approach

- Formalized hierarchical requirements
- Asks 'what must be done?'
- Measurements are considered baseline
- Steps are parsed out (see diagram)

Pro	Con	
✔		New roles for scientists, both internally and externally
✔		**Clearly defines scope, budget, schedule, risks**
✔		Complexity is inherently planned for
✔		Develops planning horizons for Program Officers/Sponsors
✔		Fosters long term sustainability
✔	✕	Requirement approach does not necessarily impose a single unique solution

GRI Questions:

- What is the GRI PM structure for design implementation and what are the qualifications and experience for top level managers?
  - Inherited deign from previous management entity, which adhered to MREFC guidelines, Battelle went through process to update requirements,
  - Neon PM- Science PhD (Bio), PMP and 14 years PM experience,
  - Project Staff appropriate experience (PMP, EVP, CPA, etc)
- How did GRI recruit and retain top-level managers, engineers, scientists and tech experts?
  - Battelle has cadre of technical staff, and PM training/best practices and training programs, not so much in ecology
- What mechanism for incorporating project management, decision making or technical input?
  - Formal PMO, WBS with CAM, IPT, Boards,

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Project Management Processes

1. Initiating
2. Planning
3. Executing
4. Monitoring and Controlling
5. Closing

Battelle came in here

- Requirements documentation/validation (systems engineering-based approach to baselining)
- Built a ‘deliverables-based’ WBS,
- Solid resource-loaded Integrated Master Schedule (IMS),
- Reorganized project structure,
- Reliance on Earned Value for cost and schedule management and critical path analysis (performance measurement)
- Opened up the infrastructure (did not try to do it all ourselves); GIT Hub, , Aeroflux,
- ‘Leadership’,

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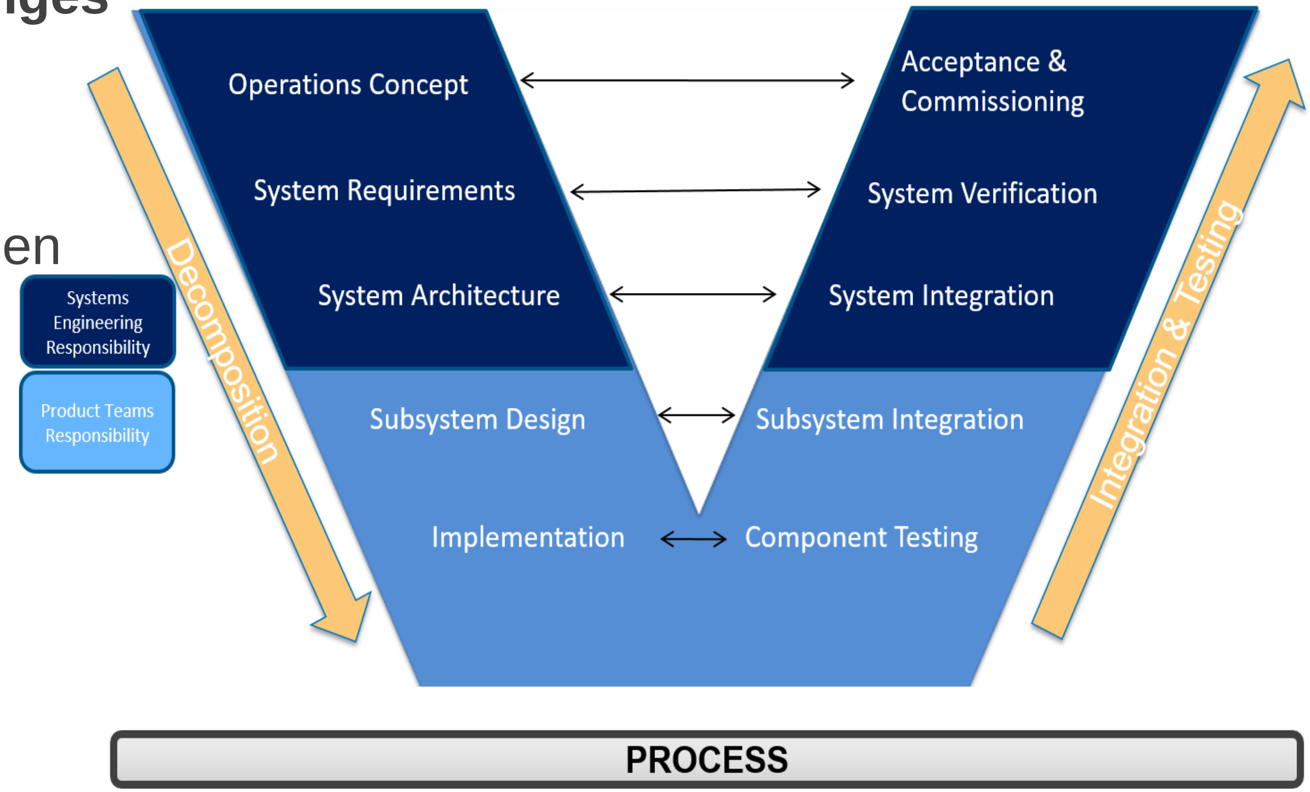
NEON Systems Engineering Challenge

1) Design Challenges

- No predecessor system
- SE has never been applied to observational sampling before NEON



2) Process Challenges

- Design process establishment *and* improvement
- Focus on lean system/product development

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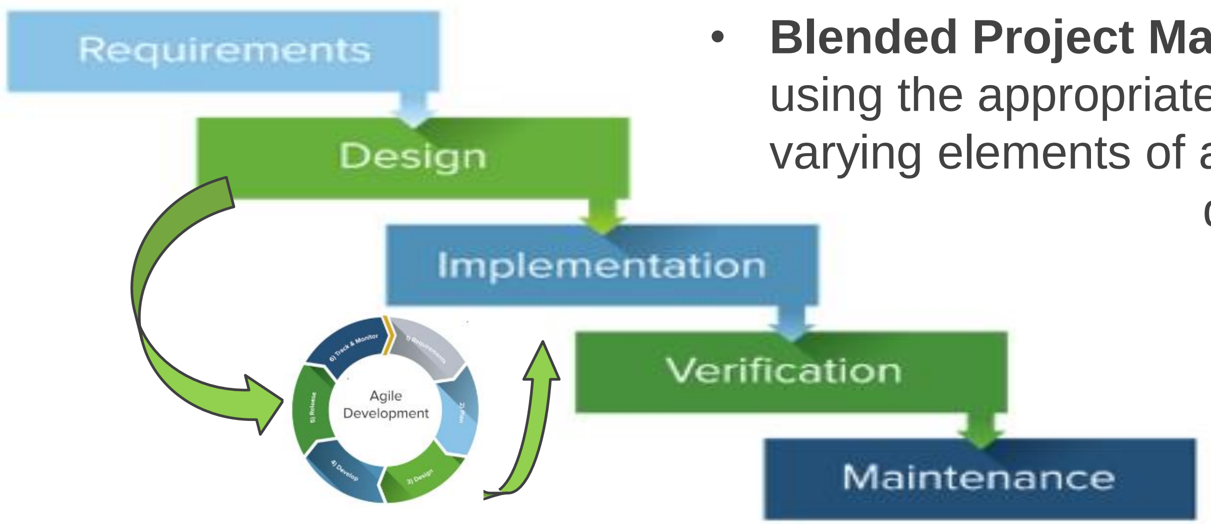
Blended Project Management

- A traditional **Waterfall Project** (linear project) provides a sequential top-down project management approach to execution of scope to a defined scope schedule and budget.

- **Agile Project** management (often used for IT projects) has continuous, short duration development cycles managed by small teams



- **Blended Project Management** is just that, using the appropriate technique to manage the varying elements of a complex scope in a dynamic environment

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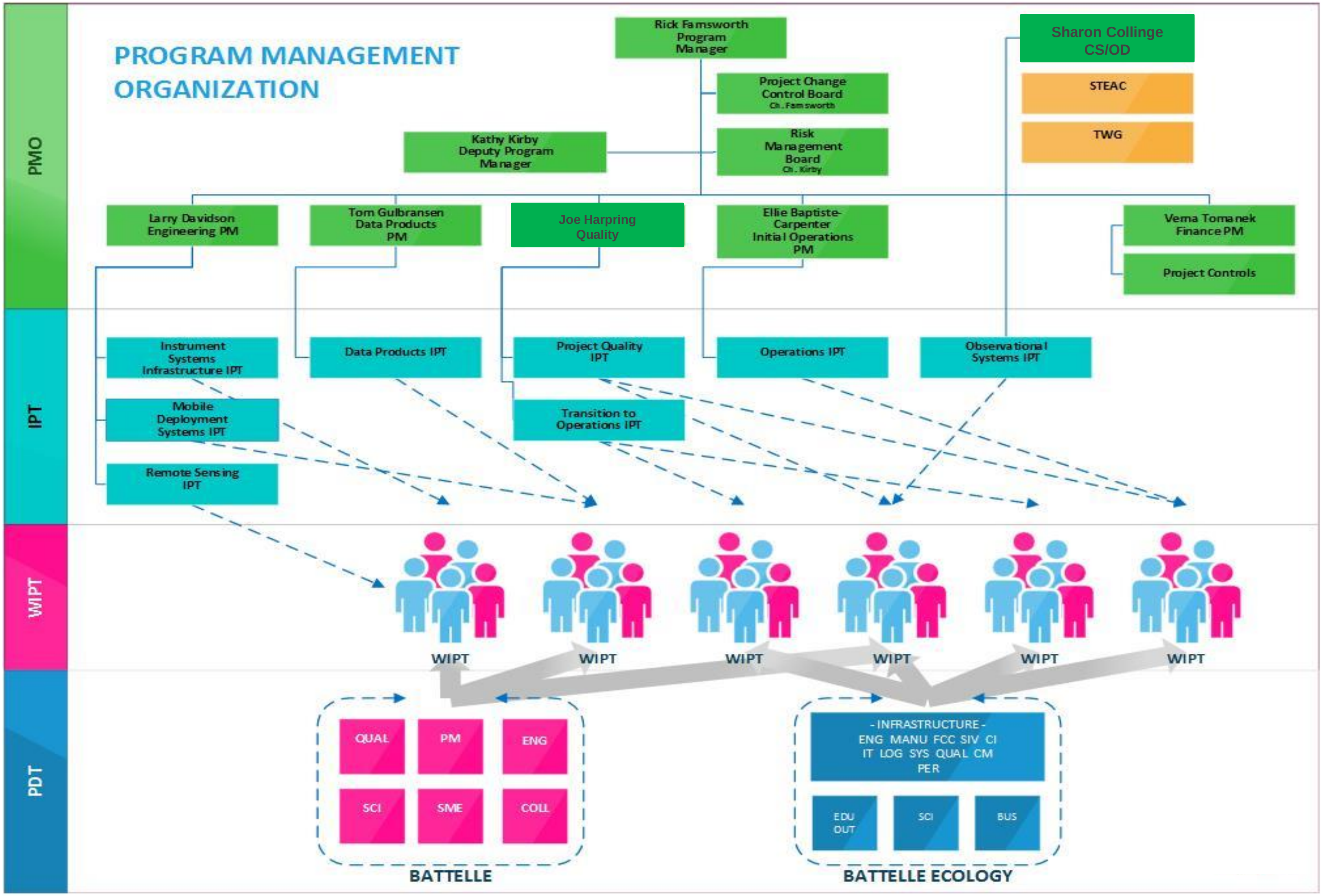
NEON Program Organization Matrixed



Change Management

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- Rigid enough to adhere to the schedule and deliver the defined scope on budget,
- Needs flexibility where required to manage unknowns and elaborative requirements
- Mature and thorough change management process, quality management, and integrated risk analysis
- Too rigid, married to uninformed decisions made without the proper knowledge, too flexible, never nail down requirements, resulting in ‘chasing scope’
- Project Change Control Board

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