

Initiating and establishing future
astronomical observatory projects

Establishing Governance and Project Scope

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Astronomy Site Testing and Training
Workshop, Nairobi, Kenya
19-23 March 2025

Moving from an idea to beginning a project



Moving from an idea to beginning a project

- An idea is developed into a project through a process
 - Project Management processes begin with Project Initiation
 - But before Project Initiation, Governance needs to be established

And momentum

Higher level
Above the
project

- Collaborative Governance
 - Develops over time, unique to the project, provides a framework for formal agreements
- Organizational Governance
 - Usually needed for projects of large scope, established before project initiated
 - Projects involving large investments from large organizations or governments
 - Can develop out of Collaborative Governance if an organization is created for the project

Lower level
Within the
project

- Project Governance
 - Well defined guidelines exist
 - Occurs prior to at the time of formalizing the project
 - Project Governance is needed in complex, non-routine projects, i.e. observatories!

Moving from an idea to beginning a project

- Establishing Collaborative Governance is not in Project Management text books
 - Some aspects overlap with Project Initiation/Integration processes
 - Defining Project Scope and developing a 'Business Case' (a.k.a. proposal) and Project Governance
 - Understanding scope and the business case are critical for establishing governance and agreements
 - Identifying project goals and scope are standard project management processes
 - Text books help! a little!

Moving from an idea to beginning a project

- Text books and guides are very prescriptive, **but they are only guides**
 - **Tailor** project management practices and governance to suit your project – Guides indicate how to get things moving
 - e.g. ECSS Standard for Space Program Management
 - https://ecss.nl/wp-content/uploads/standards/ecss-m/ECSS-M-ST-10C_Rev.16March2009.pdf
 - Phase 0 - Mission analysis/needs identification
 - e.g. Project Management Institute PMBOK GUIDE
 - Defines Business Case – We might say ‘Proposal’
- “A documented economic feasibility study used to establish the validity of the benefits of a selected component lacking sufficient definition that is used as a basis for the authorization of further project management activities.”
- “The business case lists the objectives and reasons for project initiation”



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“A documented economic feasibility study used to establish the validity of the benefits of an idea for a project that is used as a basis for the authorization of further project management activities.”

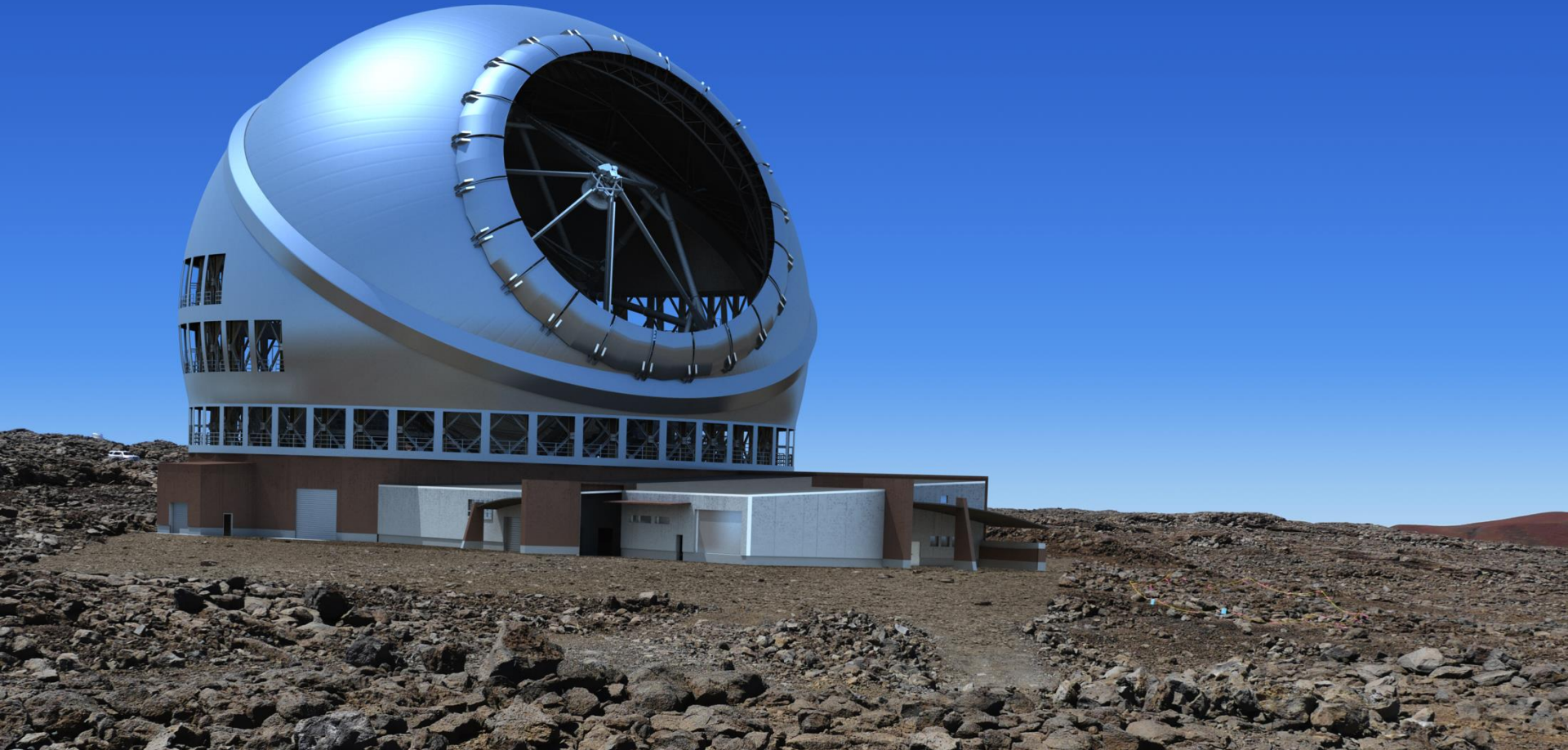
“The business case lists the objectives and reasons for project initiation”



Moving from an idea to beginning a project

- Major tasks in establishing Collaborative Governance
 - Getting agreements on project aims/goals and scope (a.k.a business case/proposal)
 - Science case(s), broader aims/benefits, cost (cash and other resources) (and possibly schedule)
 - Commitment of initial resources from stakeholders
 - Standard Project Management usually takes over after agreements are in place
 - Need enough resources to initiate the project
 - Potential stakeholders will only commit if scope, costs, aims/benefits are developed
- For most projects, establishing Collaborative Governance is needed at the very beginning to develop the idea, before formal Project Initiation
 - Collaborative Governance is applicable for multiple groups, distributed individuals, institutions and/or organizations
 - Easily tailored and expanded as an idea matures

TMT Story (Similar to other mega-projects)



TMT Story (Similar to other mega-projects)

- Began as several, independent, modest scope ‘exploratory projects’
 - Canadian VLOT (~2000) – Collaborative Governance
 - HIA, AMEC + Universities
 - California Extremely Large Telescope (late 1990s) – Collaborative Governance
 - University of California (UC) and Caltech – Project Governance (MOUs between UC a & Caltech)
 - US GSMT (~2001) – Project Governance
 - AURA NIO
- 2004 – Established TMT as its own project, amalgamation of CELT, GSMT and VLOT
 - Canada + UC + Caltech – Organizational Governance + Project Governance
- This process is applicable to projects ranging from small to mega

- Collaborative Governance
 - Identify the issue
 - Develop shared goals and vision
 - Identify stakeholders
 - Establish a governing body
 - Allocate resources
 - Build trust and relationships
 - Create a collaborative process
 - Facilitate open dialogue:
 - Monitor and evaluate progress

- Important considerations for successful collaborative governance

- Leadership
- Inclusivity
- Transparency
- Flexibility
- Capacity building

- Organizational Governance
 - Define organizational objectives and ethics
 - Engage with stakeholders
 - Establish a board of directors
 - Assign roles and responsibilities
 - Develop governance documents
 - Form committees
 - Regularly review and update governance practices
 - Implement compliance framework
 - Foster transparency and accountability

- Important aspects of organizational governance

- Strategic alignment
- Risk management
- Corporate social responsibility
- Internal controls

- Project Governance
 - Define project objectives and scope
 - Identify stakeholders
 - Establish governance structure
 - Allocate roles and responsibilities
 - Develop decision-making processes
 - Implement communication plans
 - Set performance metrics
 - Risk management framework
 - Reporting and monitoring system
 - Quality assurance procedures

- Important aspects of project governance

- Alignment with organizational strategy
- Accountability and transparency
- Flexibility and adaptability
- Continuous improvement



Common aspects of establishing governance

- Identify and engage with stakeholders
 - Astronomers, funding organizations, engineering/construction, community
 - Some stakeholders are considered customers or suppliers
- Identify shared objectives/needs/aims/interests
 - Astronomical, engineering, societal, political
- Develop governance and commitment of initial resources
 - Assign responsibilities, develop agreements, committees and decision processes
 - Monitor progress

Governance can be a committee of stakeholder representatives that attend progress meetings

Responsibilities and agreements are deliverables and resources, i.e. something that a group can work on and who will do it or pay for it

Example

- A university faculty member wants to encourage learning and teach some research techniques related to their area of academic interest
 - Idea: Characterization of transiting exoplanets with an automated telescope

Potential stakeholders	Potential interests
Exoplanet researchers	Characterizing exoplanets
University department(s), school(s)	Teaching and research infrastructure, learning opportunities
Students	Learn science/research techniques, engineering/technical skills
Other universities	Connections and collaborations, shared science interests, technical contributions
Local/National government	Workforce development, economic growth, education and outreach
Industry/economic entities	Demonstrate abilities, high profile project, new areas

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Goals/outcomes/
involvement that
stakeholders agree on

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Example

- A university faculty member wants to encourage learning and teach some research techniques related to their area of academic interest
 - Idea: Characterization of transiting exoplanets with an automated telescope
- Identify how the project can satisfy the needs of stakeholders
 - Formalize commitment of initial resources by stakeholders (MOUs/contracts)
 - Agreement that development/engineering time can be committed
 - Administrative support (managing finances, cost estimate, schedule development)
 - Specific design supports
 - Hosting community meetings
 - Formalize some outcomes
 - Published science case and design documents, an externally reviewed cost estimate and schedule, formal proposal(s) including how stakeholder needs/interests/aims are met
 - Presentations of outcomes at meetings

Support to develop these
needed from university
administration/business

Committees and Decision Process for Collaborative Governance

- All work to identify stakeholder goals must include representatives of (potential-)funding organizations and resource providers
 - University business leaders, governmental bodies in addition to scientists and engineers
 - Engage early with funding organizations and resource providers so they are ready to assume governance roles, participate on committees and in decisions
- Scientists and engineers are not good at high level project decisions!
 - The visionaries should avoid high level Collaborative Governance roles
 - Similarly in the case of Organizational Governance
 - Scientists and engineers are crucial for pushing the project forward
 - Take on advisory and scientific leadership roles
 - But they may be doing everything in the early days to turn an idea into a project!

Progressing to Project Governance

- A Collaborative Governance structure and agreements, combined with a well formed, shared vision for the project amongst all stakeholders
 - Provides the basis for formal Project Initiation and establishing a project that can be managed and delivered using tailored standard project management and systems engineering techniques
- An outcome of Project Initiation is a Project Governance framework
 - Project Initiation builds on earlier work to develop a common vision amongst all stakeholders

Progressing to Project Governance

- Project initiation is a well documented process in standard project management textbooks and guides
 - <https://asana.com/resources/project-initiation>
 - <https://www.pmi.org/learning/library/first-step-important-initiating-project-3597>
- Project Initiation involves developing internal Project Governance
- Important that internal decision makers communicate with stakeholders
 - Up to higher authorities and down to larger groups and all interests
- Decision makers must include business group representatives from funding bodies
 - Scientists and engineers provide advice to the decision makers
- Project Initiation builds on the prior work to establish Collaborative Governance

Project Initiation

“A process to define a project, to demonstrate its value, scope and secure the commitment of keys stakeholders to ensure the project is feasible and obtain authorization to start the project “

- Builds on science case(s), design and agreements already in place
- Lead by a Project Manager (astronomers and engineers are part of the team)
- Theory is not straight forward to apply to projects like astronomical observatories because
 - The idea of the project had to mature before Project Initiation can be considered
 - Astronomy projects usually don't arise from a single dominant, project focused organization
 - Typically have to satisfy a broad range of stakeholder requirements, many of which are not directly linked to astronomy
 - The limited number of suitable sites for observatories may be a complication
- One of several iterative steps in the lifetime of the project

Project Initiation

- Project Initiation consists of
 - 1) Developing the 'Project Charter'
 - Identify a Project Manager
 - Science Case document, Project Description and Top Level Requirements, Resources and Agreements
 - Project Risks, Legal Framework, Decision Process
 - 2) Identifying Stakeholders
 - Representatives and Decision Makers for internal project processes (not high level governance)
 - E.g. Change Control Board
- Move into Project Planning

Project Planning, etc.

- Project Planning is the phase of a project after initiation
 - Development of the full detailed science case or design reference mission
 - Fully define project scope, breakdown of the scope to deliverables and assign responsibilities
 - Detailed Cost Estimates and Schedule
 - Defining Work Breakdown Structure, Quality, Risks, Procurement, Stakeholder Communications
 - Deliverables are a fully defined Project Scope, Schedule and Cost
 - Governance level members have to update agreements inline with cost estimate
- After Project Planning comes
 - Project Execution
 - Monitoring and Controlling Project Work
 - Closing the Project – Handing to Operations

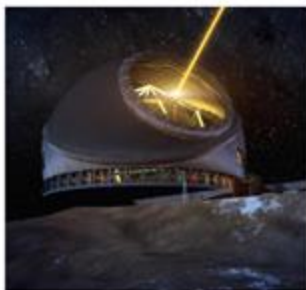
Notes on the Science Case

- The Science Case will evolve
- First version will be broad and high level
- Subsequent versions gain technical details on programs and may expand to have new science ideas – within the limits of the project scope, i.e. the envisioned/planned capabilities
- During the project execution, the science case may be frozen
 - e.g. Design reference mission
 - Project advertising/advocacy uses separate documents and materials
- Eventually, the Science Case document should cover a range of areas
 - Either lots of areas of astronomical research
 - Or multiple questions that can be addressed by a single capability

Notes on the Science Case

TMT Detailed Science Case 2022

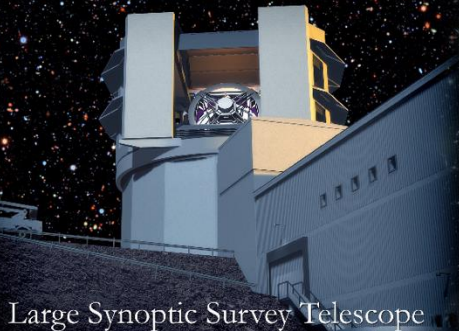
TMT.PSC.TEC.07.007.CCR03



Shown is a rendering of the Thirty Meter Telescope during nighttime operations using the Laser Guide Star Facility (LGSF). The LGSF will create an artificial star, each astronomer specifically chosen according to the particular adaptive optics system being used and the science program being conducted.

September 27, 2022

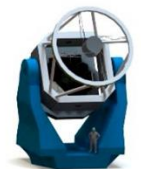
LSST Science Book



Large Synoptic Survey Telescope

Version 2.0, November 2009

NEW ROBOTIC TELESCOPE: SCIENCE CASE



OCT 2020

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ABSTRACT

NRT is a project to build the world's largest (4m) robotic telescope (New Robotic Telescope - NRT) at the Observatorio del Roque de los Muchachos, La Palma. The larger collecting area and lower mass of the 10 segment primary mirror (which will enable 30 second response time to event triggers) are the critical advances over current facilities, with both metrics being improved by a factor 4 over the current Liverpool Telescope (LT). By building NRT we aim to transform our users potential to lead scientific exploitation of the many massive new time-domain astronomical survey facilities being built by international partners. The scientific case for NRT has recently become even stronger with the discovery of EM counterparts to gravitational wave (aLIGO/Virgo) and neutrino (IceCube) sources. A proposed spectroscopic classification survey (SPEC) will classify 10,000 objects per year and represents an increase of a factor of 5 over the current combined worldwide effort of all observatories (2,000/year). In addition to the transient classification survey, P-led proposals to time allocation committees will also be supported.

1

arXiv:1610.02743v1 [astro-ph.CO] 10 Oct 2016

CMB-S4 Science Book First Edition

CMB-S4 Collaboration
August 1, 2016

- Eventually, the Science Case document should cover a range of areas
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Summary

- Engage with all stakeholders to build on an initial idea
 - Develop and iterate the ideas for the project as stakeholders are engaged
- Engage stakeholders early
 - Incorporate their needs into the project and seek formal agreements
 - Identify shared objectives
 - Recognize that high level project decisions should be led by the funding organizations with advice from scientists and engineers
- Use Project Management techniques as a guide
 - Tailor the application of techniques to the project (all processes must be useful)
- Collaborative Governance is an appropriate approach
 - Flexible, evolves
 - Forms the basis for Project Governance (and Organizational Governance if needed)

Group Activity

- Break into groups of five

Group Activity

1. Generate an idea for an astronomy project

- Identify potential stakeholders
- List each stakeholder's objectives



- Visitor center, public education
- Teaching observatory
- Experiment – Any wavelength
- General purpose facility
 - Small user group
 - Large user group
- Upgrade a facility
- Develop an instrument



Group Activity

1. Generate an idea for an astronomy project
 - Identify potential stakeholders
 - List each stakeholder's objectives
2. Specify a project with scope to satisfy all objectives
3. Set out a governance structure, responsibilities and resources to initiate the project
 - List what committees there should be and who is on them
 - List what is needed to initiate the project
 - List project initiation activities
4. Project planning (scope, cost and schedule)
 - Break down a few deliverables and think about their cost, the duration and the overall project cost and schedule, consider human resources

Each group of five

Assign a presenter and note taker for each stage

Discuss each step for 10 minutes (15 for step 4)

Presenter reports each group's outputs