Eggleton: examining leadership in megascience projects

David Eggleton

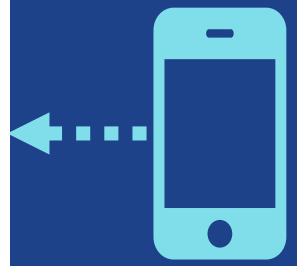
Publication date
04-06-2020

Document Version
Published version

Examining leadership in megascience projects

David Eggleton
d.eggleton@sussex.ac.uk

11th Annual International Science of Team Science Conference



UNIVERSITY OF SUSSEX | BUSINESS SCHOOL

Leadership for Effective Team Science, Sociotechnical Systems, Organization/Management Factors and Institutional Policies

Five key questions

SCIENCE POLICY RESEARCH UNIT

~~Who are you?~~
Why?
What did you look at?
What did you find?
So what?

Why?

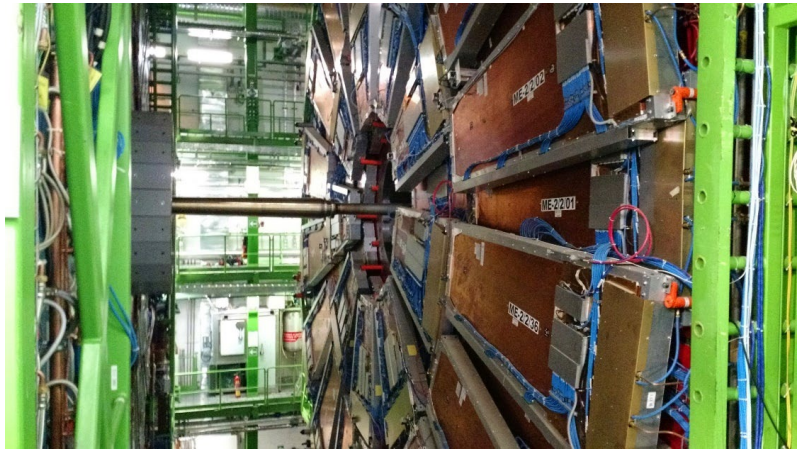
Megascience projects are a subcategory of megaprojects (which have budgets of at least $1 billion) that incorporate a high or very high level of technological uncertainty.

- Often the preserve of senior individuals acting as representatives of the discipline
- Scientists who sacrifice themselves to ensure good provision for others
- Accounts of scientific leaders exist but tend to be biographies rather than a broader study of leadership within scientific projects

- Modern reality contrasts with historic effort of a single individual (Newton → Cavendish laboratory → Radiation Lab). Now involves coordinated effort but leaders play an important role in organisation and direction
- Ernest Lawrence
- Robert Oppenheimer
- Bob Wilson
- Carlo Rubbia

What did you look at?

The Large Hadron Collider (LHC) at CERN (Franco-Swiss border)



The Tevatron at Fermilab (USA)

The ATLAS and CMS experiments at CERN

What did you find? (1)

Characteristic	Restrictions
Technical competence	Essential
Management ability	Essential for middle managers
Vision	Essential for first senior leader
Charisma	Essential
Transactional characteristics	Middle managers at project end stages
Guided democracy	Only observed in experimental collaborations
Team empowerment	Essential
Trustworthiness	Essential

Leadership development in megascience projects

- Secondary to core objectives
- Within laboratory structure
- Experiential (Apprenticeship)
- Identification based on technical competence
- Formal training as a support tool for practical skills and understand organisational functions
- Alternative ‘technical guru’ pathways

What did you find? (2)

Phase	Characteristics of phase	Characteristics of phase-specific senior leader
Initiation	Many technical ambiguities. Internal debate over which big machine should form basis of laboratory strategy	Authoritarian. Technically focussed. Very charismatic. Well-suited to transformational or authoritarian leaders
Approval	Internal debate settled around machine. Funding for machine required which necessitates agreement amongst stakeholders	Democratic. Consultative. Seeking to build consensus and trust amongst stakeholders
Construction	Civil engineering and machine assembled. Project leader takes lead role and has freedom to be authoritarian if necessary	Oversight of the project leader. Rarely intervenes except in the event of a major crisis which risks loss of stakeholder trust
Exploitation	Shift in focus: a) Fully exploiting the now-completed machine b) Horizon scanning to determine the characteristics of the next big machine	Support role to help the laboratory and collaborations generate data. Moving resources to help individuals investigate promising technologies for the next big machine.

So what?

Contribute to Team Science training programs

- Leadership and ‘softer skills’ increasingly emphasised both in research and industry
- Provides some of the foundations in the development of such programs

Laboratories

- Embrace the finding that leaders are trained within the laboratory environment and provide assistance to help with the identification.
- Re-focus existing leadership training programmes to become more of a crash course in how to navigate the laboratory’s procedures and processes.
- Start selecting senior leadership with the intention of enabling these project phases

Extend Study within Science

- Incorporate additional HEP laboratories into the study (KEK, SESAME, other DOE labs)
- Bring in other types of megascience project into the study (ESA, NASA, Falcon Heavy (SpaceX), LIGO, ITER)
- Look at laboratories outside of physics altogether

Acknowledgements

Ben Martin, Puay Tang, Martin Meyer, CERN Archives, Fermilab History & Archives Project, Josh Siepel, Andy Davies, INSciTS 2020 Organizing Committee, Duke University

UNIVERSITY OF SUSSEX | BUSINESS SCHOOL