Optimising megascience project leadership
Evidence from the Tevatron and the Large Hadron Collider (LHC)

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Megascience Definition & Study Design

The definition of megascience is experiments or other projects with budgets in excess of one billion US dollars, undertaken by laboratories [1]. The successful endpoint of a megascience project often occurs when both experimentation and all upgrades are complete. The focus then can shift to a new subset of science which necessitates the construction of new apparatus [2].

The case study design was formed according to the schematic displayed in Figure 1.

Results

Table 1: Summary of the characteristics of leaders in megascience projects and which levels these characteristics were observed

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

This poster has identified the characteristics and training of leaders in very large physics projects (Table 1), and discovered how to optimise the selection of senior leaders to meet certain phase-specific project needs (Table 2). Recommendations for future megascience projects such as the Future Circular Collider (FCC) are to embrace the finding that senior leadership is selected to enable certain phase specific project needs.

A. Laboratories should reconfigure such procedures to limit terms served by senior leaders

B. Laboratory stakeholders should consider how future candidates can meet the five year needs of the project in light of the four phases identified above.

References

2. Eggleton, D., Examining the relationship between leadership and megascience projects, in Science Policy Research Unit. 2017, University of Sussex: Brighton, UK.