THE UNIVERSITY OF
ALABAMA IN HUNTSVILLE

The Impact of the Faster, Better, Cheaper Movement at NASA on Perceptions of Failure and Success of NASA Projects

Shivani Patel, Casey E. Eaton, Bryan Mesmer PhD

Research Objective

This research investigates NASA's current policies regarding cost, schedule, and technical objectives in light of previous Faster, Better, Cheaper policies (FBC), and compares how current NASA employees perceive failures against FBC objectives.

History of Faster, Better, Cheaper at NASA

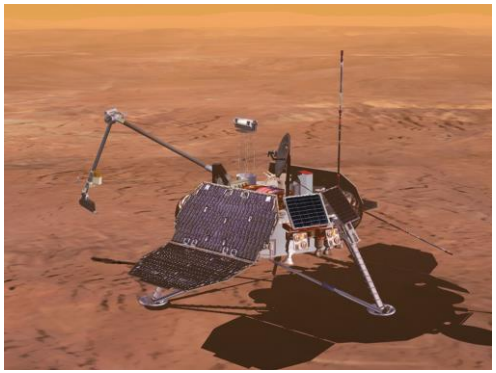
- Faster, Better, Cheaper (FBC) objectives at NASA aimed to reduce overall costs and implement a shorter timeline for projects by emphasizing smaller, more frequent missions.
- FBC was a drastic shift for NASA after Apollo era and its emphasis on large, flagship missions.
- FBC era at NASA lasted from 1992 to 2001, ending with the resignation of NASA Administrator Daniel Goldin [1],[2].
- The FBC ideology has been attributed as a cause for multiple failures at NASA [3].
    - 6 out of 25 missions failed from 1996 to 2000

Missions of the FBC Era

- Successful missions
  - Mars Global Surveyor (1996)
  - Mars Pathfinder (1997)

- Failed missions
  - Lewis (1997)
    - Lost after 3 days in orbit
  - Mars Climate Orbiter (1998)
    - Destroyed due to mismatch in units from two teams
  - Mars Polar Lander (1999)
    - Crashed into surface of Mars

Mars Global Surveyor [4]



Mars Polar Lander [5]

Methodology

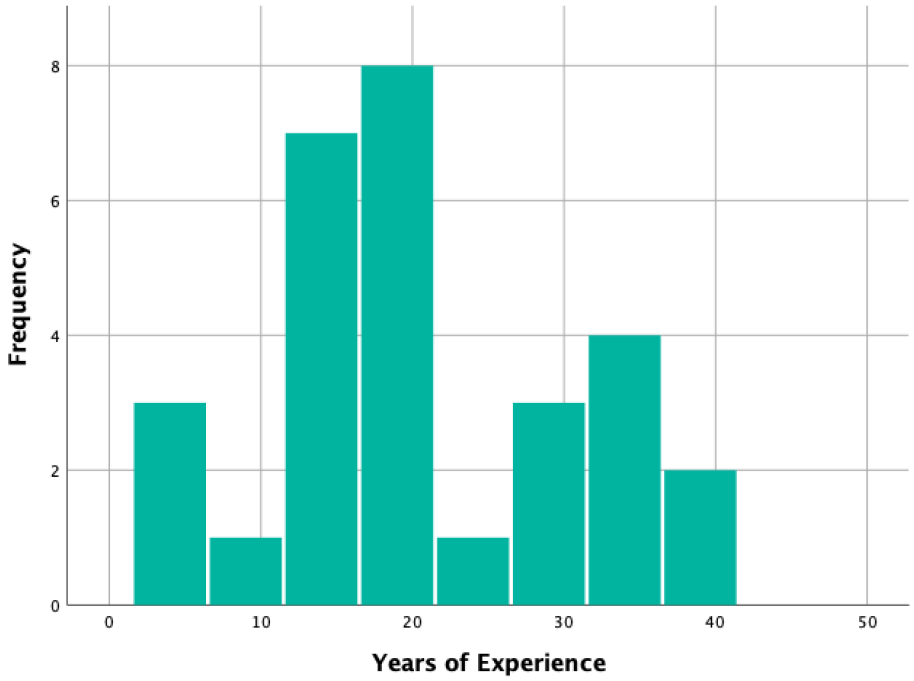
- A survey was created to identify perceptions and definitions of failure by NASA employees.
- The results of the survey were used to investigate current and past NASA policies, along with NASA audits regarding current projects, with a focus on how FBC might be impacting NASA projects today.

Survey Development

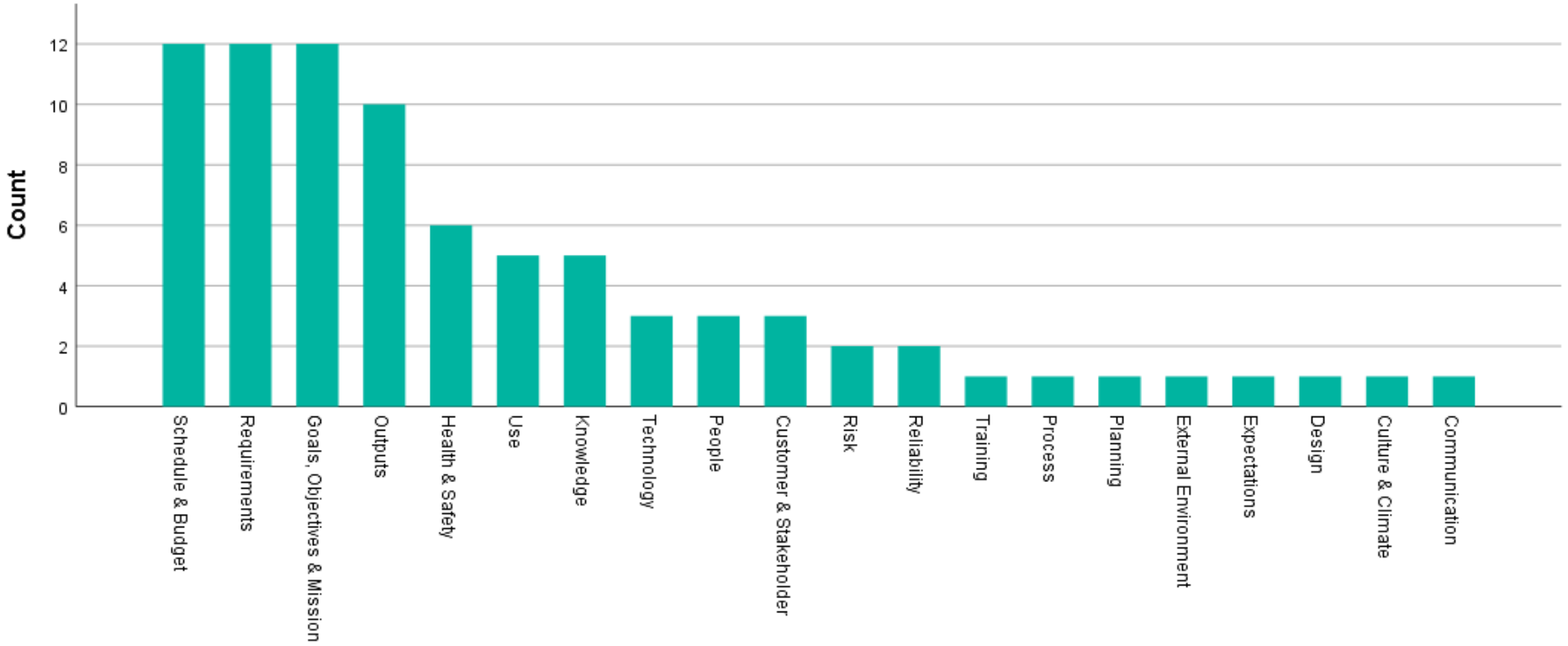
- A comprehensive database containing 400 academic sources on failure was created and used to develop questions for the survey.
- The survey was divided in three sections:
  - 1) free-response questions regarding definitions and causes of failure
  - 2) Likert scale questions asking participants to identify which specific factors, out of fourteen given factors, impacted project failure
  - 3) demographic questions
- They survey was taken by 31 participants with experience working on NASA projects.

Survey Results (Demographics)

- The survey respondents represented 8 out 10 of the major NASA field centers.
- Participants had an average of over 20 years of experience (median = 19)
- 58% of participants worked for NASA during the FBC era.
- Most participants had largely technical educational backgrounds.



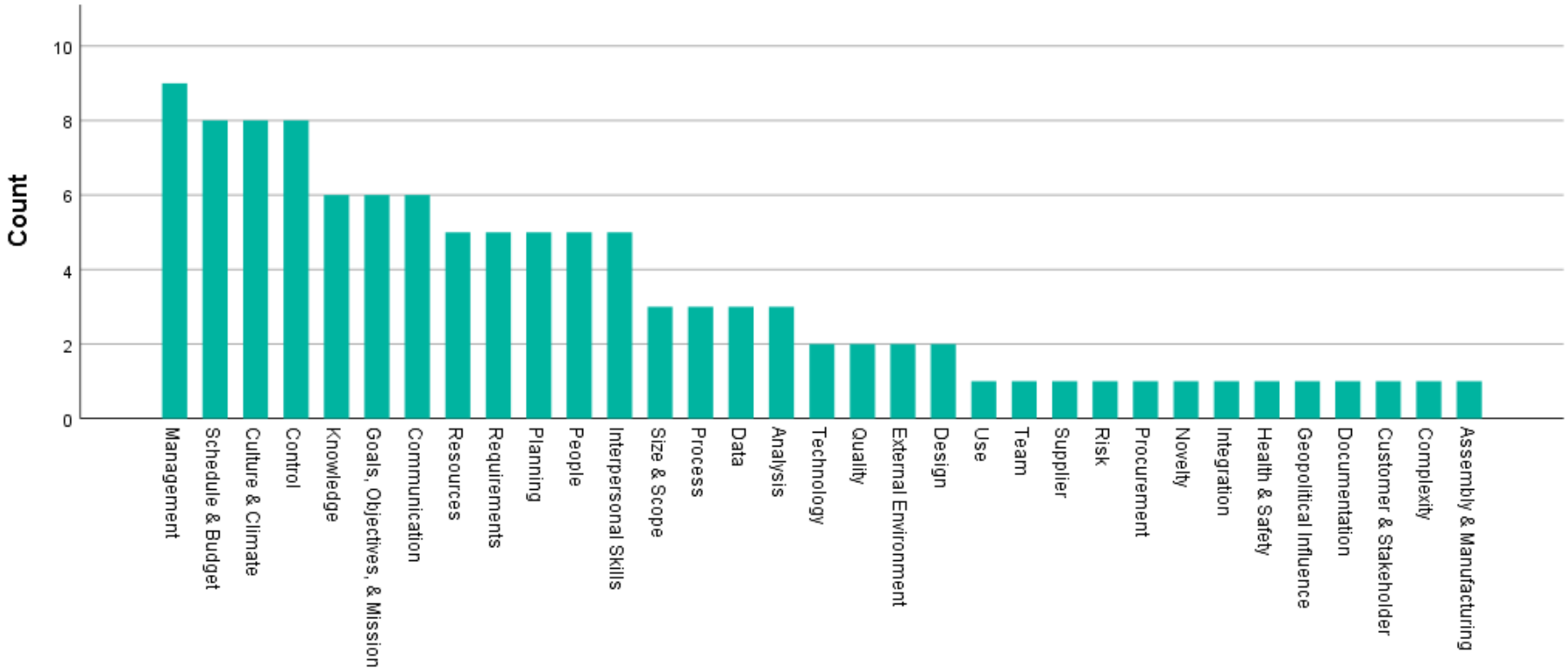
How would you define failure in aerospace system development projects?



Survey Results (Free Response)

- Several similar responses were identified when participants were asked to define failure:
  - "Failure to meet **cost, schedule and/or technical** objectives"
  - "No performance: **technical, cost, and schedule**"
  - "Failure to meet safety, **programmatic (cost/schedule), or technical** objectives."
  - "Project failure occurs when the system does not meet the user's requirements or when the project is terminated due to **poor technical, schedule or cost performance**"
  - "Projects that fail to meet **technical, cost, schedule**, and/or safety or other stakeholder expectations."
  - "A project that fails to meet **schedule, technical, or cost** requirements."

What factors (circumstances, events, details, or characteristics of a project) have led to failures in projects you have worked on?

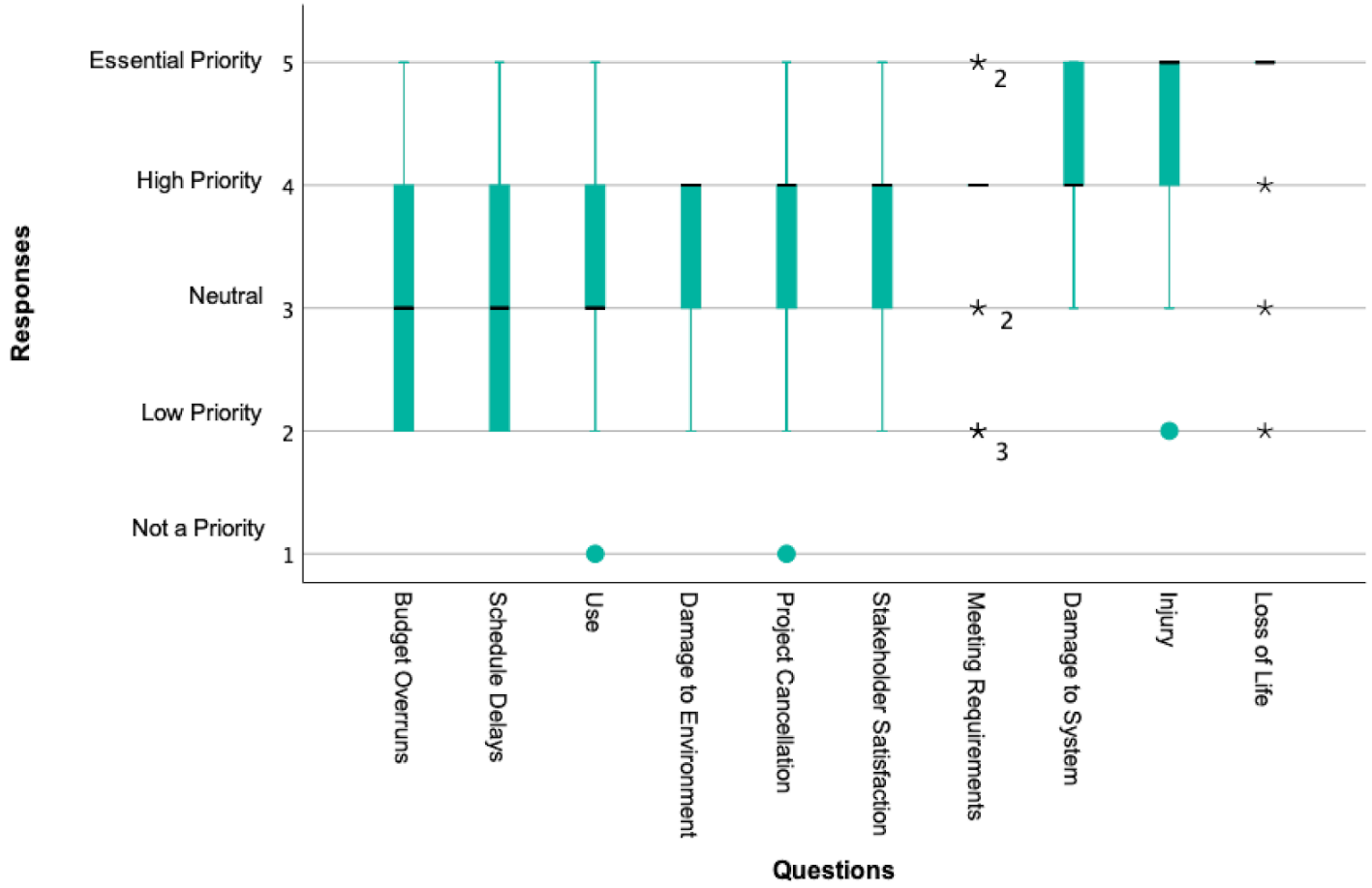


Survey Results (Free Response)

- Responses to factors that lead to failure commonly noted issues related to planning and inaccurate estimations:
  - "The biggest cause by far is **not adequate upfront planning**…"
  - "Project was **underestimated** or personnel resources were not available to staff the project according to plan."
  - "**Unrealistic / optimistic planning**."
  - "Failure of **proper planning** and oversight."
  - "…inadequate basis of estimate for budget and schedule…"
  - "…lack of **realistic** resource needs."

Factor Questions

Q: Evaluate the following factors by how much of a priority NASA gives to preventing each failure scenario.



Survey Analysis

- Free Response Questions
  - Participants defined failure as not meeting cost, schedule, and technical performance objectives.
  - Participants believe that optimistic planning regarding schedule and budget causes failure.

- Factor Questions
  - Participants believed that NASA was neutral on prioritizing the prevention of budget overruns and schedule delays

Comparisons to FBC

- Participants' definitions of failure directly align with concepts from FBC policies.
  - Not meeting cost, schedule, and technical objectives are conceptually similar to "faster, better, and cheaper"
- Through analysis of NASA documentation, several measures of performance directly corresponding to FBC concepts were found.
  - Audits from NASA and the Government Accountability Office (GAO) specifically consider cost, schedule, and technical performance objectives in their lifecycle reviews.

FBC in Current NASA Policies

- NASA Strategic Plans that include FBC terminology (faster, better cheaper):
  - 1998, 2000
- NASA Strategic Plans that mention cost, schedule, performance, technical objectives:
  - 2003, 2006, 2011
- Most recent NASA Strategic Plan (2018) does use FBC terminology or related concepts.
  - NASA documents, including the 2019 and 2020 Office of the Inspector General (OIG) audits still emphasize current projects through meeting cost, schedule, and performance goals.

Conclusions

- This research identified that many NASA participants perceived and defined failure in meeting cost, schedule, and technical objectives, also noting issues of planning and optimism in these areas.
- NASA's lack of clarity regarding FBC policies could be directly impacting perceptions of failure at NASA, which ultimately affect the reliability and success of NASA projects.

Future Work

- Noting the parallels between FBC and current terms used to identify failure in NASA projects, criticisms and benefits of FBC may be worth revisiting in the future.
- Future policies at NASA should embrace the residual ideology of FBC present at NASA, or form policy that explicitly demonstrates a shift away from FBC.

References

- [1] R.L. Dilon and P.M. Madsen, "Faster-Better-Cheaper Projects: Too Much Risk or Overreaction to Perceived Failure?," *IEEE Trans. Eng. Manag.*, vol. 62, no. 2, pp. 141-149, May 2015, doi: 10.1109/TEM.2015.2404295
- [2] H. Lambright, "Leading change at NASA: The Case of Dan Goldin," Space Policy, vol. 23, no. 1, pp. 33-43, Feb. 2007, doi: 10.1016/j.spacepol.2006.11.011.
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