Attributes of Independent Project Reviews in NASA

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Abstract: In some costly failures of projects within the National Aeronautics and Space Administration (NASA), NASA has been criticized for their improper use or lack of independent reviews in projects. To begin to understand some prospective success characteristics of project reviews within NASA and potentially across engineering management, a qualitative case study methodology was used with four NASA projects to identify key attributes of independent project reviews. These attributes were identified in relation to categories of reviewer, reviewee, and the review type. Within each of these categories, attributes were identified and characterized as size, competence, independence, authority, culture, and formality.

Keywords: XX

EMJ Focus Areas:

The review of projects is not new to any organization. In most projects there are the standard phase or gate reviews that determine if a project should move forward on a technical or managerial level. In the science community the peer review process is used to select a project based on its potential to achieve its scientific and technical objectives. Both of these review concepts involve individuals or groups external to an organization, but more recently, many projects within the U.S. government have come under scrutiny for their use of independence in project reviews both in their selection and lifecycle development. In 2000 the escalating costs and scientific and technology failures of the Lawrence Livermore National Laboratory’s laser fusion project was attributed to the U.S. Department of Energy and the Livermore laboratory’s reluctance to “systematically explore underlying science and technology issues through independent peer review” (Bodner and Paine, 2000). In 2003, after five years of debate, the U.S. Army Corps of Engineers will be required to seek an independent evaluation of large-scale projects before work begins (Landers, 2003). Even the medical industry is demanding better independent reviews for an active process of continuous quality improvement (Bellin and Dubler, 2001). The President’s Freedom to Manage specifies that government needs to become more citizen-centered and less bureaucratic. Independent reviews can allow for checks and balances that are less bureaucratic and more citizen-centered, with the involvement of expert peers outside an organization on review boards. Independent reviews focus programs on results-oriented outcomes and do not allow for the burden of proof to be shifted and ignored in an organization.

In the National Aeronautics and Space Administration (NASA), an organization that is frequently in the public eye and is often held highly accountable for its failures, the use of independent review boards is not new either. But, their definition of independence and their function in the organization are not well defined. The role of independent project reviews of four NASA projects will be described and used to perform qualitative analysis for delineating the attributes of independent project reviews in NASA projects. These attributes of projects reviews in determining project success will be further defined and their impact on project and engineering management will be described. Finally, future research direction for the study of independent reviews in project and engineering management will be identified.

Theoretical Motivation

In project management, reviews are looked upon as a formal extension of the project’s network to provide an objective opinion of the project’s status. The informal extension of networks in an organization is defined by social network theory. These networks, classified by their interpersonal, interunit, and interorganizational connection, have been extensively studied in strategic alliances and collaboration, communication, friendship, workflow, advice, and group membership (Brass et al., 2004). Social network theory has shown that these informal networks that cross social divides are associated with performance related outcomes (Burt, 1992). Crossing social divides involves individuals and groups outside their organization and alters the degree of independence that these individuals and groups play in the organization. Cross and Cummings (2004) looked at 101 engineers and 125 consultants in knowledge-intensive work and showed that the extension and ties of individuals outside their organization were related to individual performance; therefore, it is fundamental to this article that many of the values of social network theory in individual and organizational performance are applicable to the formal networks of project reviews. Not only should project reviews have a positive impact on performance, but also regular evaluation of projects has been shown to have a positive impact on management being less likely to continue commitments to failing projects (Keil and Robey, 1999).

Still there is variance in the purpose of project reviews, degree of independence, level of resources made available, and methods used to conduct reviews in an organization (Shapira et al., 1996). In an assessment of practices in the evaluation of U.S. modernization programs, Shapira et al. (1996) identified a number of unanswered issues with the evaluation and review of programs:

- Perspectives can vary on what should be measured and how, with an imbalance on the importance of quantitative (metrics) versus qualitative measures
Relevance of Independent Reviews in NASA

Prior to the release of NASA’s new guidelines on program and project management (NPR 7120.5C) on March 22, 2005, there was only mention of the need to plan and conduct independent reviews, but any definition of these reviews was left to the discretion of management. The significance of independent review boards in NASA was most noted in the two Space Shuttle accidents. In the recommendation of the Space Shuttle Challenger accident, the Rogers Commission stated that an Office of Safety, Reliability, and Quality Assurance should be established that “...should be independent of other NASA functions and program responsibilities” (Rogers, 1986). NASA responded to this recommendation by creating an office that was independent of NASA in both organization and budget. Over time, between the Challenger and Columbia accidents, this office migrated to internal organizational and budgetary control. The Columbia Accident Investigation Board (CAIB) report made note of this deterioration by stating, “...independent checks and balances intended to increase safety have been eroded...” (CAIB, 2003).

The CAIB again called out for the need for independent reviews by recommending an independent technical engineering authority be established with “no connection to or responsibility for schedule or program cost.” In two smaller programs mishap investigation boards again noted the importance independent review for project success. In the Comet Nucleus Tour (CONTOUR) the mishap investigation board report stated that one of the root causes of the project failure was an inadequate review process and that the peer and independent review process should be reassessed. For the Mars Surveyor Program, which managed both the Mars Polar Lander (MPL) and Mars Climate Orbiter (MCO), the mishap investigation board stated of the two failures that one of the root causes was “improper independent reviews” (Griner and Keegan, 2000). Exhibits 1 and 2 summarize the identified issues and recommendations from notable mishap investigation reports. These reports represent a time span in NASA from 1986 to 2003, and each report specifically mentions the need for independent reviews for program/project success.

In December 2003, at the NASA/USRA Workshop of Research Topics in Program and Project Management, representatives from universities, industry, NASA, and other government agencies identified, defined, and prioritized the most critical research topics for NASA program and project management. One of the top research challenges identified was “what is missing in the traditional review processes; identify different processes for different project types; document the relative values of independent reviews and internal versus external reviews” (CPMR, 2004). I will focus on the later of these research challenges. Because of the results of the investigations described in Exhibits 1 and 2 and the above mentioned challenges, NASA’s new release of its guidelines on program and project management specify that programs and projects must have a Project Review Plan, reference independence in relation to reviews, analysis, and assessment of its programs and projects 146 times (93 times in the previous version), and describe project reviews with defined requirements (NASA, 2005, March 22).

Methodology

A case study research methodology was chosen because it allowed for the characterization of real-life events, such as organizational and managerial processes, and there was no requirement for control over behavioral events; thus, allowing for the capture of holistic and significant experiences (Eisenhardt, 1989; Grillham, 2000; Yin, 1994). Eisenhardt (1989) stated that case studies can provide description, test theory, or generate theory. She describes that a fundamental difference in case study research as compared to experimental research is in the selection of the sample population. Cases are chosen for theoretical reasons, not statistical reasons. One of the reasons for this, and why case study research was chosen for this investigation, was to extend emerging theory. Case study research provides a conduit to go from theory to data and back to theory.

The approach was to use a descriptive case study methodology (Yin, 1994). To address any threats to validity as defined by Yin, multiple sources of evidence were supported by data source triangulation (see Exhibit 3 for sources of data) (Denzin, 1984; Stake, 1995; Yin, 1994), multiple case studies were used for cross case analysis (Eisenhardt, 1989), and a study protocol was established for future replication and to reduce any bias in the collection of data. The case study procedure followed Eisenhardt’s recommended steps for performing case study research:

1. Define research question with a priori constructs: Using constructs from the literature, a research question was defined related to conducting independent project reviews.
2. Select case(s) based on specific population and sampling to replicate or extend emerging theory: Four cases were investigated that represent two failures and two successes in NASA programs (see Exhibit 3). Combined, these cases represented different levels of using independent reviews in managing projects, how they may have reflected project success, and the maturation of “faster, better, cheaper.” These four cases were used to identify attributes in the use of independent reviews in NASA projects.
3. Craft instrument to promote triangulation among data sources:
   a. Interviews: Semistructured, open-ended, conversational format to allow interviewees to speak freely and openly about their experiences. Interviews ranged from 30 minutes to 2 hours based on the interviewee’s availability and depth of information. A single interview session was performed with each subject, with follow-up interviews on an as-needed basis. At least five key personnel related to each project were interviewed.
### Exhibit 1. Summary of Comments and Recommendations by Space Shuttle Investigative Boards

<table>
<thead>
<tr>
<th>Program/Project</th>
<th>Source Document</th>
<th>Board Identified Issues</th>
<th>Board Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space Shuttle</td>
<td>Report to the President by the Presidential Commission on the Space Shuttle</td>
<td>Of the management, organizational, and communication failures that contributed to the accident... “a lack of problem reporting requirements, inadequate trend analysis, misrepresentation of criticality, and lack of involvement in critical discussions.”</td>
<td>• An independent body should oversee the Space Shuttle's qualification and testing</td>
</tr>
<tr>
<td>Challenger</td>
<td>Challenger Accident (Rogers Commission), June 6, 1986</td>
<td></td>
<td>• Create an independent NASA Office of Safety, Reliability, and Quality Assurance. The office should be assigned the work force to ensure adequate oversight if its functions and should be independent of other NASA functional and program responsibilities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• NASA should establish a STS Safety Advisory Panel.</td>
</tr>
<tr>
<td>Space Shuttle</td>
<td>Shuttle Independent Assessment Team Report (McDonald Report), March 2000</td>
<td>• Communication difficulties exist between all parties particularly in accepting feedback from the workforce, Aerospace Safety Advisory Panel, and independent assessment groups.</td>
<td>• An independent review process, utilizing NASA and external domain experts, should be institutionalized (prior to making four more flights).</td>
</tr>
<tr>
<td>Program</td>
<td></td>
<td>• An independent review of policies and procedures related to closing Problem Reports by waiver or as unexplained anomalies is recommended. This same issue has appeared in a number of other areas</td>
<td>• The SIAT feels strongly that NASA Safety and Mission Assurance should be restored to the process in its previous role of an independent oversight body, and not be simply a “safety auditor.”</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>• The design and the post Solid Rocket Booster recovery inspection and re-certification for flight should be looked at and analyzed in careful detail by follow-on independent reviews.</td>
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<td></td>
<td></td>
<td></td>
<td>• The SIAT believes that Aerospace Safety Advisory Panel membership should turnover more frequently to ensure an independent perspective.</td>
</tr>
<tr>
<td>Space Shuttle</td>
<td>Columbia Accident Investigation Board (CAIB Report), August 2003</td>
<td>• Managers asked, “Who’s requesting the photos?” instead of assessing the merits of the request.</td>
<td>• Establish an Independent Technical Engineering Authority that will independently verify launch readiness.</td>
</tr>
<tr>
<td>Challenger</td>
<td></td>
<td>• “Safety and Mission Assurance organizations supporting Shuttle Program are largely dependent upon the Programs for funding, which hampers their status as independent advisors.”</td>
<td>• Prepare a detailed plan for defining, establishing, transitioning, and implementing an independent Technical Engineering Authority.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• “Over the last decade, little to no progress has been made toward attaining integrated, independent, and detailed analysis of risk to the Space Shuttle system.”</td>
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</table>

These people represented program management, project management, administration, team member (e.g., engineer, scientist), and customer. Each interview was recorded on audiotape and transcribed.

b. Documentation: Formal studies, evaluations, journal articles, survey data, mass media, and physical artifacts (samples of work done).

c. Archival and Historical: Letters, memoranda, policy statements, regulations, proposals, guidelines, procedures, summary reports, organizational records, and personal records.

d. Participant Observation: NASA gave permission for participation in its Academy of Program and Project Leadership training programs. This included project management training classes.

4. Enter field in such a way as to overlap data collection analysis: Data was collected in an iterative process; documentation and archival information was extensively analyzed before interviews were conducted; collected verbatim transcriptions; after each interview, data was compared against documentation and archival information to determine if additional data was needed from any data sources (e.g.,
Once this was performed, the analysis was completed when only small marginal improvements could be made to the theoretical validation.

7. Enfold literature by comparing results with conflicting and similar literature: Compared conclusions based on an extensive review of the literature.

8. Reach closure about when to stop iterating between theory and data: Once the final analysis was completed, a final iteration was performed to develop and refine a final theoretical statement about the findings.

**Results and Discussion**

**Attributes of NASA Project Reviews**

A cross-case analysis was performed to identify attributes that were either consistent among all four case projects or different between the subsets of successful and failed projects. Although there were additional factors that were identified in the data collection that follow-up interviews, additional documentation) before the next interview was conducted.

5. Analyze data within and across case(s): A 40-page case summary was written based on a predetermined case format (Shenhar, 1999). Case studies were performed in an iterative process where the completion of each case study was followed by a within-case analysis to gain familiarity with the data and evaluate the theories. The study of the next case was started before the previous ended; therefore, an overlap of the data collection and analysis strengthened the analysis and helped reveal any adjustments that needed to be made to the data collection methods.

6. Shape hypothesis by looking for replication not sampling logic; iterative tabulation of evidence for each construct; refine definition of constructs: Once the case studies were developed for all of the projects, a qualitative cross-project analysis was performed to determine patterns and anomalies.
were specified by a data source as contributing to project success or failure, only those consistent across cases or within the project subsets will be discussed. The cross-case analysis revealed three categories in which the identified attributes in project reviews could be classified. Exhibit 4 is a summary of these categories and attributes, followed by a detailed description.

**Reviewer—Size.** There is limited evidence or academic literature that associates size of project review boards to effective and efficient reviews or project success. In addition, there was variation in size of review boards for both successful and unsuccessful projects, which made it improbable to compare size to project success. What was consistent across the case projects was that project management specified that review board size was critical to having successful project reviews. Project management associated this success with being able to effectively communicate among reviewers and the project team and to efficiently perform reviews. A Lunar Prospector scientist stated that large review boards tend to “paralyze NASA” and that “it spreads the blame so thin that nobody is ever responsible.” While no project could quantify large versus small review boards, this statement was echoed in all projects as they worked to maintain very “lean and mean”

<table>
<thead>
<tr>
<th>Category</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reviewer—those that participated on the project review boards</td>
<td>Size</td>
</tr>
<tr>
<td></td>
<td>Competence</td>
</tr>
<tr>
<td></td>
<td>Independence</td>
</tr>
<tr>
<td></td>
<td>Authority</td>
</tr>
<tr>
<td>Reviewee—those in project management and on the project team that participated in the reviews.</td>
<td>Competence</td>
</tr>
<tr>
<td></td>
<td>Culture</td>
</tr>
<tr>
<td>Review type</td>
<td>Peer</td>
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<tr>
<td></td>
<td>Semi-Formal</td>
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</tbody>
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**Exhibit 3. Case Overviews**

<table>
<thead>
<tr>
<th>Mission</th>
<th>Description</th>
<th>Statement on Independent Project Reviews</th>
<th>Project Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mars Pathfinder</td>
<td>A single vehicle (lander), with microrover and several instruments designed to demonstrate a low-cost system for cruise, entry, descent, and landing on Mars.</td>
<td>Mars Pathfinder viewed independent reviews as an important part of project success, spent significant resources on establishing an independent review committee, and viewed the committee as an integral part of the project.</td>
<td>Success—Was marked as one of NASA’s most historic and accomplish successes since the first Space Shuttle launch.</td>
</tr>
<tr>
<td>Lunar Prospector</td>
<td>A spin-stabilized spacecraft designed to map the surface composition and magnetic field of the Moon.</td>
<td>Lunar Prospector viewed independent reviews as critical to project success, and stressed that reviews should be seen as opportunities and not a trial.</td>
<td>Success—The data collected has allowed for the construction of detailed maps of the surface composition of the Moon and results have been ten times better than ever planned.</td>
</tr>
<tr>
<td>Comet Nucleus Tour (CONTOUR)</td>
<td>A single spacecraft and six scientific instruments designed to provide a detailed look at comets, and answer questions about how comets act and evolve.</td>
<td>The mishap investigation board report stated that one of the root causes of the project failure was an inadequate review process and that the peer and independent review process should be reassessed.</td>
<td>Failure—The solid rocket motor failed when it was scheduled to accelerate the spacecraft out of Earth orbit and place it on a trajectory toward its first comet.</td>
</tr>
<tr>
<td>Mars Climate Orbiter (MCO)</td>
<td>A single spacecraft that would operate in Mars’ orbit collecting weather data from Mars and act as a relay station for Mars Polar Lander.</td>
<td>Both spacecraft failed and the mishap investigation board would later state that one of the root causes was “improper independent reviews.”</td>
<td>Failure—A failed coding of metric units in the ground software file resulted in the spacecraft buring up during Martian orbit insertion.</td>
</tr>
</tbody>
</table>
review teams. Without a knowledge base of what is an effective and efficient project review board size, some projects were later criticized for having review boards that were essentially too “lean and mean” as key subject matter experts were not part of reviews. This leads to the next factor, competence.

**Reviewer—Competence.** Competence was described by the case projects as experience of the reviewers in performing project reviews and the reviewer’s technical expertise in a specific subject matter. The experience of the reviewers in performing project reviews was clearly identified by all projects as important to review success. A Lunar Prospector project manager said of the program manager, “He got a very high level, extremely experienced set of reviewers to be our annual review.” All of the projects specified that great effort was taken to handpick reviewers and when someone was identified as a good reviewer, great effort was taken to keep them as part of future project reviews. A CONTOUR project manager stated, “…we took down names and numbers to know who to call back and who not to call back, they were worth their weight in gold.” Discrepancy did exist between the successful and failed projects in the technical expertise of reviewers. An MCO project manager stated that in the review of a key subsystem there was not any expertise resident in any detail on reviews. The mishap investigation boards for both of the failed projects cited a failure to use adequate subject matter experts in project reviews and their involvement in the projects as contributing to the missions’ failures.

**Reviewer—Independence.** For the successful projects, the use of people independent to the funding and management organization was viewed as being important to project success. These projects spent significant resources on outside consultants and people who were considered “non-NASA” and experts in their field. A project manager stated that they viewed these people as “little independent contractors” and subcontracted them to be on review boards. In the failed projects there was less use of reviewers independent from the funding organization or the main contracting organization. These projects stated that because of cost restrictions they were unable to reach too far outside the organization to secure independent subject matter experts for reviews.

**Reviewer—Authority.** All the projects believed that review boards should have limited authority over the project. Their responsibility should be to evaluate the project and provide timely recommendations. In Lunar Prospector, a project manager stated that the review team only had an advisory capacity, and only one comment was ever used from their recommendations. For Mars Pathfinder, management stated that with all of the reviews, they made sure that review boards did not micromanage the project. The project managers for these projects believed that a review board that tried to tell the project how to do the project would only slow down the schedule.

**Reviewee—Competence.** In NASA projects, the common assumption is that project team members are experienced with a superior technical expertise. While this is the case with most NASA projects, NASA is not immune to developing young aspiring engineers and placing them in challenging situations. In MCO, the mishap investigation board cited the experience of the engineers as contributing to the technical failure. A project manager stated on MCO, “…you are able to come in at a lower cost because you use less experienced people.” Experienced team members not only bring a technical experience but experience in performing and participating in project reviews. An over reliance on inexperienced team members on project reviews can result in what one project manager described as, “…you do not know when the board is being lied to or the person making the pitch does not understand the material.” For the projects in this study, the review boards did not have the time to judge the competence of the project team. Assumptions were made that what they were told was credible and valid. For MCO, a project manager later stated that board members should have been “pushing much harder for a believable explanation of the navigation targeting predictions.”

**Reviewee—Culture.** Organizational culture was found to play a significant role in influencing the attitude and approach to each project and their reviews. Some of the key terms and phrases used that defined the culture of each of the projects were a “success culture,” “fear of failure,” “arrogance,” “we know how to do it,” and “honesty.” In all of the projects there was an urgency and desire to succeed, but in the failed projects, there was a sensitivity related to a fear of failure or arrogance. Over time the project’s developed a “protective shield” toward outside opinion. This impacted the openness and thoroughness of project reviews. In addition, past success had created an over confidence in present success. One project manager stated that in these FBC mission, “You have got to change the culture. You can’t do things this way if you’re going to keep the old culture.”

**Review Type—Peer.** Each project identified peer reviews as critical to project success, and more important than the formal phase reviews. Peer reviews were defined as those performed by peers who were considered knowledgeable in a subject (e.g., subject matter experts), occurred on an informal basis (e.g., not set to a project schedule or milestones), and not always independent from the organization. A project manager from Lunar Prospector said the most valuable reviews for their project were “…the independent, informal reviews from experts…independent experts looking over your shoulder.” The degree of independence of these peer reviewers from the project was a discrepancy between the successful and failed projects. For the failed projects comments were made that, “It was mandatory that we did not get a second set of eyes on everything we needed to. Otherwise we could have met the cost goals,” and, “Having the budget squeezed on the faster, better, cheaper, really did result in an inadequate peer review.” The mishap review boards for both projects stated that independent experts were not adequately used in the evaluation of the project. In social network theory, the role of peers in project and individual success has been well documented, but there is sanctity of theory on how independence of peers from the project team can impact project success.

**Review Type—Semi-Formal.** The four projects presented represent a maturation of FBC, and thus a maturation of the organizational, and managerial approach used by NASA toward FBC. When FBC first started, NASA used a “hand’s off” approach, putting faith in project management and reducing the bureaucratic oversight. For the two successful projects, that occurred earlier
in the development of FBC, project reviews were considered semi-formal. For Lunar Prospector, they even changed the names of these reviews so people would not think of them as the traditional formal reviews. As the principal investigator stated, “We changed the name so that nobody would know what the hell we were doing and decide that they had to have the usual NASA four thousand people there with a two-week review.” These semi-formal reviews were then tied to milestones in the project and not formal schedules. Progress and risk was then gauged against these milestones. Mars Pathfinder defined their reviews as a “rolling wave.” A project manager stated that in an FBC mission there are just “too many parallel threads going along” to have formal scheduled reviews. As FBC evolved and mishap or failures began to occur, NASA moved away from the semi-formal reviews and got tighter and tighter in its review of FBC missions. As one project manager stated, “It very quickly became a standard NASA program and approach and oversight.”

Implications on Project and Engineering Management

There is limited guidance in most organizations on how to formulate, conduct, and manage the dynamics for successful project reviews. In most projects, these issues have been recognized either by management heuristics or chance. This article presented some key attributes of project reviews that are not documented in most project review guidance, but is the heuristic knowledge of experienced project and engineering managers. In addition, there is limited and scant research in this area to fully support the inadequacies of project reviews, but there is potential for immense value in how these issues can impact a project.

Attributes identified such as size, competence, authority, and culture, are not defined or addressed in most organization’s project review guidance. Organizations’ policies on project reviews usually only cover the process of project reviews directly related to the phases of the project life cycle, and do not cover the organizational dynamics of reviews (e.g., competency, authority, culture). Because the attributes identified in this study were more associated with organizational dynamics than engineering processes, it is my contention that these attributes should be institutionalized in an organization’s processes and policy, and not be solely dependent on the heuristic knowledge of project and engineering managers. While independence was identified as an attribute, no degree of independence can resolve issues related to other identified attributes such as competence and authority. Finally, as these attributes can influence the review process, attributes such as authority, independence, and competence can have a more significant impression on how a project may respond to recommendations from the reviews. For example, opinion formation influenced by authority, competence, and independence can create confusion to reviewer recommendations.

To further address the implications of the results on project and engineering management, I go back to Shapira et al. (1996) to validate and expand upon what they identified as unanswered issues with the evaluation and review of programs. Exhibit 5 shows how the six unanswered issues identified by Shapira et al. are justified by the results of this research; yet, this investigation expanded these issues to include the project management and team (Reviewee) as also having a significant impact on project reviews. Shapira et al. (1996) and most studies on project reviews focus on the impact that project reviewers have on the project and do not show how the project management and team can be held as accountable to the success of project reviews.

Research Limitations

Although this article validated and expanded some of the current theory on independent project reviews, it was not without limitations. While the sample set used in this investigation was well defined, it was also this well-defined sample set that may limit the ability to correlate the results to other NASA programs and to project and engineering management. The sample set of case studies was on FBC missions that had unique constraints (e.g., time and budget) to most NASA missions, which can impose unique limitations on how the projects performed independent reviews; therefore, some of the conclusions may not be applicable to other NASA projects (e.g., human or larger scale missions). This can cause limitations in generalizing the conclusions to other programs and projects, not only in NASA but also across the discipline of project and engineering management. These projects were viewed in retrospect, and while this allowed for a more extensive data collection pool, a retrospective view also can create some bias in the analysis as some interpretations or

**Exhibit 5.** Comparison of Attributes as Defined by Cross-Case Analysis to Shapira et al. (1996)—Unanswered Issues With the Evaluation and Review of Programs

<table>
<thead>
<tr>
<th>Shapira et. al.</th>
<th>Supported Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perspectives can vary on what should be measured and how, with an imbalance on the importance of quantitative (metrics) versus qualitative measures</td>
<td>Reviewer: Competence; Authority</td>
</tr>
<tr>
<td>Relevant and timely feedback from reviews to the project</td>
<td>Reviewer: Competence</td>
</tr>
<tr>
<td>Inadequate knowledge and experience of reviewers</td>
<td>Reviewer: Authority</td>
</tr>
<tr>
<td>Independent reviewers can impose unwanted and unnecessary standards and policies without knowledge or consideration of important local differences</td>
<td>Reviewer: Authority and Responsibility; Competence</td>
</tr>
<tr>
<td>Multiple and conflicting purposes of various reviews throughout the project life cycle</td>
<td>Review Type: Peer; Semi-Formal</td>
</tr>
<tr>
<td>Reviews are sometimes focused on program justification and not program learning</td>
<td>Review Type: Peer; Semi-Formal</td>
</tr>
</tbody>
</table>
conclusions could already have been made by the interviewees based on popular opinion and not objective analysis.

Conclusions
Most project managers will express the importance of project reviews and tell you they are critical to project success. All the interviewees in the four cases expressed this opinion, but there is still a limited amount of research that validates this tacit and intuitive view. I believe the practice of independent project reviews is still invalidated and not well defined. Further research needs to be performed on:

- What are project reviews, what do they do, and what are their characteristics (e.g., frequency, duration, quantity, size, degree of independence)?
- What is the quantifiable impact of project reviews on project success?
- Why are project reviews used and why are they important?
- When and where should reviews be used in a project (e.g., communication and integration with the project)?
- Who should be part of the project review process (e.g., review board formation, qualification of reviewers)?

It is my contention that the answers to these questions will also vary based on differing types of projects. For example, as a project’s complexity (i.e., the project scope and interconnection between project elements) and technological uncertainty (i.e., uncertainty centered around a technologies development, maturity and knowledge) increase, the need for independent subject matter experts in project reviews will increase; but, as the complexity and technological uncertainty increase, the availability of subject matter experts in relation to the time, resources, and quantity will decrease. That is, the development of the next generation space vehicle is highly complex and will involve a high degree of technological uncertainty, but the number of subject matter experts knowledgeable in this type of product will be limited and they may already be part of the organization, limiting their independence to the project. As more projects become more complex (e.g., system of systems), they will require new paradigms in how they are managed and reviewed.

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