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APPROVAL SIGNATURES		DATE
Gregory Blaney (original signature on file)	Management System Representative	10/29/2004

REVISION HISTORY			
Rev. No.	Description of Change	Author	Effective Date
Basic	Initial Release	Tim Menzies	09/10/2003
A	Update for currently employed practices	Lisa Montgomery	05/25/2004
B	Updated reference documents to include relevant standards. Evaluated and updated the metrics collected as a result of this process.	Wes Deadrick	11/03/2004

REFERENCE DOCUMENTS	
Document Number	Document Title
NPR 1441.1	NASA Records Retention Schedules Flowchart
IVV 16	Control of Quality Records System Level Procedure
IVV 09-3	Research Program
IVV 09-3-6	Conducting research initiative performance reviews
NASA STD 8739.8	Standard for Software Assurance

1.0 Purpose

This work instruction provides requirements for assessing research initiatives managed by the IV&V Facility, specifically: University Initiatives (UIs), Center Initiatives (CIs), and Facility Initiatives (FIs). Such research is to be assessed according to:

- Its penetration either into NASA software development projects or an IV&V project, measured using the **Penetration Factor**.
- Its penetration into the international software engineering research community, measured using the **Normalized Paper Impact**.
- Performance at the initiative performance reviews, measured using the **A, B, and C scores**.

2.0 Scope

The general requirements within this work instruction apply to research funded by the Office of Safety and Mission Assurance (OSMA) Software Assurance Research Program (SARP), as well as research sponsored by the IV&V Facility through the Director's Discretionary Fund (DDF). This work instruction applies equally to CIs, UIs, and FIs managed directly at the IV&V Facility as well as CIs which are managed by a Government Point of Contact (POC) at a NASA Center. In both cases, the methods for evaluating the quality and performance of the research are the same.

3.0 Definitions and Acronyms

3.1 "A" Score

An "A" project is worthy of presentation as a good exemplar of research as judged by the reviewers at the initiative performance review.

3.2 Authorized Reviewers

Persons authorized by the Research Lead to evaluate and score research performance at **initiative performance reviews**.

3.3 "B" Score

A "B" project is proceeding adequately as judged by the reviewers at the initiative performance review.

3.4 "C" Score

A "C" project is under-performing and is a candidate for termination as judged by the reviewers at the initiative performance review.

3.5 Penetration Factor

The goal of NASA's OSMA research is to generate applied results for NASA projects. Hence, an important success measure for this research is how much the research penetrates (is used by) projects:

9: Results actually used by project
8: Data passed back to project
7: Data used by researcher
6: Data passed to the researcher
5: Project agrees to provide data to the researcher
4: Positive response to contact
3: Project contacted
2: NASA project targeted
1: No project targeted

(Note that there is no level "10" penetration factor. A level 10 would indicate that research results are routinely used by many NASA projects.)

3.6 Normalized Paper Impact

A project's publication rating is the maximum **Normalized Paper Impact (NPI)** of publications generated by a given research initiative.

The Impact (I) of a research paper is evaluated on the basis of where the paper has been published. All journals and refereed conferences are not equal. Some are paper mills, whereas others carefully screen what they publish. Venues (where a paper is presented or published) are ranked on the basis of how often other researchers cite the venue. The ranking

becomes a measure of the credibility of a given venue. Impact ratings are defined for over a thousand venues at http://citeseer.nj.nec.com/impact.html (as of August 12, 2003 these factors range from 0(worst) to 3.31(best) with a median rating of 0.51). In assigning the Paper Impact, the paper is given the impact rating of the venue in which it was published. If the venue isn't on the list, the paper is given median impact rating of the venues on the list. In the example above, that would be 0.51.

The Normalized Paper Impact (NPI) is obtained by comparing the paper to the Maximum Possible Impact (MPI) rating at the time of the comparison. In the example, that would be 3.31 (note that the figures used in the example are relatively stable over time; hence, timing isn't extremely critical in making the comparison). The NPI is converted to a scale of 0 through 9 to be similar to the scale used for penetration factor. The normalized paper impact is calculated as follows: NPI=I*9/MPI.

3.7 Initiative performance Reviews

The regular project review teleconferences consisting of the Research Lead or a designee, the WVU Research Liaison, reviewers, the Principle Investigator (PI), Government POC, and the Research Support Contractor.

3.8 Principal Investigator (PI)

The Principle Investigator (PI) is the primary researcher responsible for conducting the research tasks described in a proposal for a funded research initiative.

3.9 Reviewers

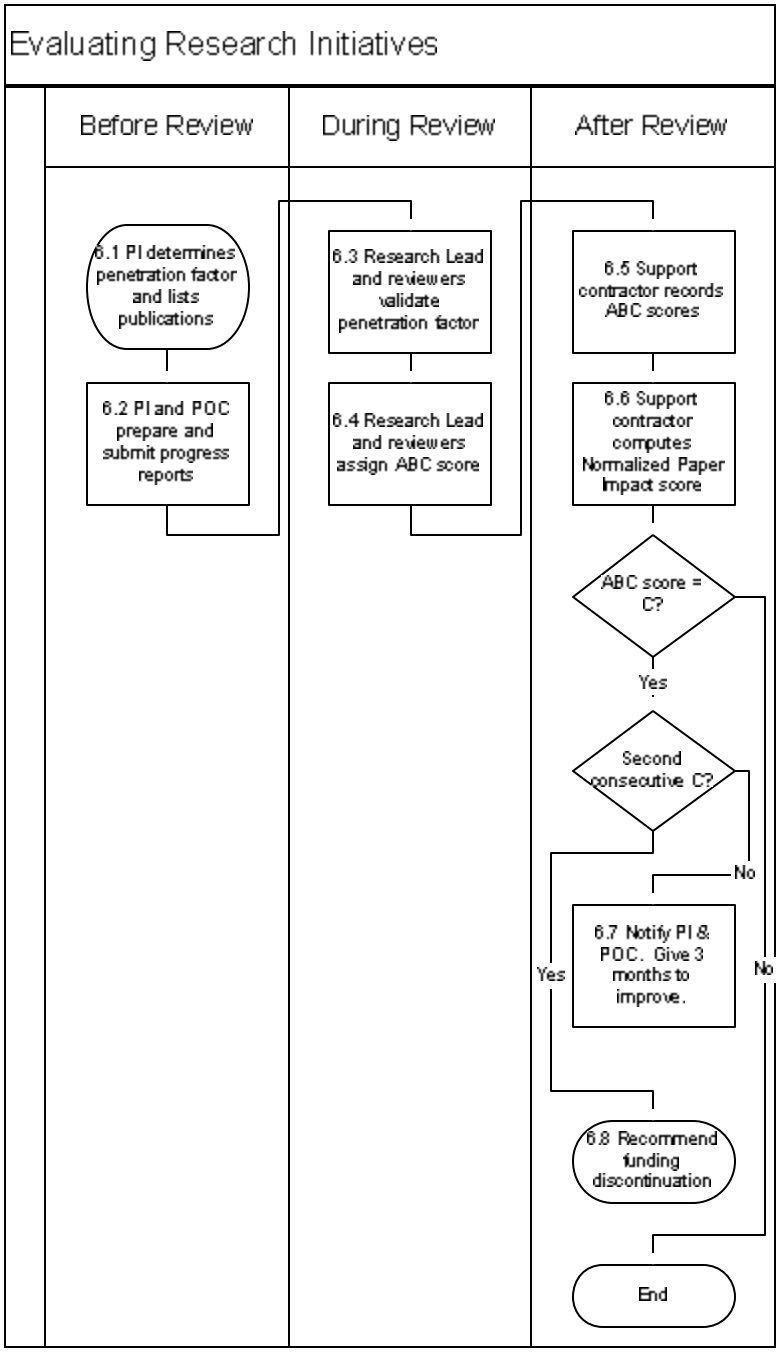
In the context of this work instruction, the reviewers are the persons responsible for evaluating an initiative during an initiative performance review. The reviewers typically consist of the Research Lead, the Research Chair, and the POC.

3.10 Acronyms

CI	Center Initiative
CIM Tool	Center Initiative Management Tool
DDF	Director's Discretionary Funds
FI	IV&V Facility Initiative
I	Impact (of a research paper)
IV&V	Independent Verification and Validation
MPI	Maximum Possible Impact
NPI	Normalized Paper Impact
OSMA	Office of Safety and Mission Assurance
PF	Penetration Factor
PI	Principal Investigator
POC	Point Of Contact
SARP	Software Assurance Research Program
UI	University Initiative

4.0 Flow Chart

Figure 4-1 is a flowchart of the Research Initiative Evaluation Process. The procedures and work instructions for this process are described in Section 6. The step numbers in Figure 4-1 correspond with the step numbers in Section 6.


Evaluating Research Initiatives
Before Review
During Review
After Review
6.1 PI determines penetration factor and lists publications
6.2 PI and POC prepare and submit progress reports
6.3 Research Lead and reviewers validate penetration factor
6.4 Research Lead and reviewers assign ABC score
6.5 Support contractor records ABC scores
6.6 Support contractor computes Normalized Paper Impact score
ABC score = C?
Yes
Second consecutive C?
No
6.7 Notify PI & POC. Give 3 months to improve.
Yes
No
6.8 Recommend funding discontinuation
End

5.0 Responsibilities

5.1 Research Lead (or his/her Designee)

Shall:

- Oversee the review process.
- Assign reviewers.
- Chairs initiative performance reviews and participates as a reviewer.
- Notifies the POC when an initiative is given an unsatisfactory score by the reviewers.
- Recommends to OSMA, for CIs and UIs, and to the IV&V Facility Director, for FIs, discontinuation of funding of initiatives that have received two consecutive "C" scores.

5.2 Reviewers

Shall:

- Participate in initiative performance reviews.
- Validate the Penetration Factors (PF) and other information provided by the PI or POC. The PF will be validated against the information contained in the initiative performance review template submitted by the PI or POC.
- Score each initiative with an "A", "B" or "C" score.

5.3 Government Points Of Contact (POCs)

Shall:

- Offer Penetration Factors for each initiative performance review.
- Submit initiative performance review forms through the CIM Tool at least 5 days prior to the review (forms are located on the CIM Tool).

5.4 Principal Investigator (PI)

Shall:

- Coordinate with the POC on the information in the performance review forms.

5.5 Research Support Contractor

Shall:

- Record Scores, Penetration Factors, and Normalized Paper Impacts in the Center Initiative Management (CIM) Tool.
- Compute average ABC scores and Normalized Paper Impact scores and generate reports as requested by the Research Lead.

6.0 Procedure

6.1 PI Determines Penetration Factor and Lists Publication

In preparation for a scheduled initiative performance review, the PI shall determine the penetration factor and list his or her publications and conference presentations resulting from the research initiative.

6.2 PI and POC Prepare and Submit Progress Reports

The PI and POC jointly prepare for the initiative performance review in accordance with WI 09-3-6. Their presentation serves as the basis of the discussion in the initiative performance review. The POC is responsible for submitting the initiative performance review material once completed.

6.3 Research Lead and Reviewers Validate Penetration Factor

During the initiative performance review, the Research Lead and the Reviewers shall discuss the PI's rationale for the recommended Penetration Factor and agree with the proposed Penetration Factor or correct it.

6.4 Research Lead and Reviewers Assign an A, B, or C Score

During the initiative performance review, the Research Lead and the Reviewers review and discuss materials submitted by the PI or POC. The PI and the POC may present the material or may simply answer questions. The research lead and reviewers evaluate the performance of the research initiative and also review the Penetration Factor and the list of publications. On this basis, the Research Lead and each Reviewer score the progress of the research initiative as “A”, “B”, or “C”. At the conclusion of the initiative performance review, the Research Lead and the reviewers compare scores.

6.5 Support Contractor Records ABC Scores

The Support Contractor collects reviewer rating sheets and records the ABC scores in a spreadsheet.

6.6 Support Contractor computes Normalized Paper Impact Score

After the initiative performance review, the Support Contractor uses the list of publications and conferences to calculate a Normalized Paper Impact.

6.7 Notify PI or POC of the Score

If the research initiative received an overall score of “A” or “B”, no further action is required. If the initiative received an overall “C”, the Research Lead notifies the POC that the project is in jeopardy of losing funding and that the initiative must show significant improvement within 3 months.

6.8 Recommend Funding Discontinuation

If an initiative scores a “C” at two consecutive initiative performance reviews, the Research Lead contacts the funding organization, either OSMA for SARP research, or the Facility Director for DDF research, to recommend discontinuing the funding for the research initiative.

7.0 Metrics

The following metrics along with discussions at weekly staff meetings, research initiative reviews, and other meetings are used to monitor, evaluate, and continually improve this process. Each metric is to be tracked for trend analysis to understand where resources are being applied and with what results. The intent is to improve existing processes and continually revisit research focus strategies. The metrics will include:

- Trend of Penetration Factors from year to year within projects
- Trend of Penetration Factors across projects
- Trend of the Normalized Paper Impact within a project
- Trend of the scores per project received during the initiative reviews

8.0 Records

The following records, as shown in Figure 8-1, are generated and managed in accordance with IVV 16 and reference to NPR 1441.1, NASA Records Retention Schedules.

Document Name and Identification Number	User Responsible for Record Retention	Retention Requirement	Location
Initiative performance review meeting minutes (to include penetration factors, publication impacts, and ABC scores)	Support Contractor	Permanent	CIM Tool and IV&V Facility Shared Drive S:\Asset\Quarterly Materials

Figure 8-1: Initiative Performance Review Records