



Case Study: Facilitation Processes for NASA Goddard Space Flight Center Enterprise Architecture

Overview of Systems Engineering And Project Management Plan

**Kim Terrell
M.S. in Space Studies**

November 25, 2008

Extracted from Kim Terrell's report submitted to International Space University (ISU)
corresponding to work at NASA Goddard to satisfy the Master of Science in Space Studies Degree
Strasbourg, France, 2004

Katz International Management Solutions LLC, (KIMS)

kim.terrell@katz-ims.com

<http://katz-ims.com>

202-544-KIMS (5467)

Table of Contents

	Page
Introduction	01
GSFC Enterprise Architecture Work	02
<u>Center EA</u>	
<u>EAWG: Who We Are and What We Do</u>	
<u>EAWG: Tasks and Objectives - NASA Headquarters</u>	
<u>Responsibilities to Goddard Space Flight Center</u>	
Systems Engineering and Project Management Processes	03
<u>Project Plan</u>	
Work Breakdown Structure	
Timeline	
Risk Management Strategy	
Metrics Analysis	
Achievements	09
<u>Work Products</u>	
<u>Management of GSFC EAWG Committee</u>	
<u>Team Participation</u>	
<u>Team Ownership</u>	
<u>Trusted Facilitator</u>	
Conclusions and Lessons Learned on Developing and EA	11
<u>EA</u>	
<u>Document by Committee</u>	
<u>Staying the Course During Changing Leadership</u>	
<u>Leveraging Collaboration Tools</u>	
Acronym List	12
References	13
Appendices	13
<u>Figures List</u>	
<u>Quote List</u>	

“(Kim) I would like to thank you for all your efforts and energy in getting this first phase (of Enterprise Architecture) accomplished. As you have seen, there are a lot of people with ideas and inputs at GSFC, usually what is missing is someone to keep things focused. You have filled that role for this group. Well done!”

Curt Suprock, NASA GSFC Enterprise Architecture Working Group

Introduction

This case study captures best practices for facilitating and Enterprise Architecture (EA) working group, and documents the systems engineering and project management processes utilized to produce a center-wide response to NASA Headquarters on behalf of Goddard Space Flight Center (GSFC).

The work included was originally contained within Kim Terrell's Master's thesis; a report of the work completed at Goddard, during the summer of 2004, in a Stay-In-School temporary federal appointment, to satisfy graduation requirements for the Master of Science in Space Studies degree from the International Space University.

The purpose of circulating this subset of the original work is to demonstrate an understanding and utilization of systems engineering, project and program management processes that can assist organizations in developing Information Technology (IT) and institutional infrastructure inline with requirements set forth by the NPR 7120.7.

Enterprise Architecture is a strategic tool to link NASA's IT strategy to those of its missions, programs and business processes. EA addresses the need to manage IT inline with capital assets, investments, and budgetary processes to increase efficiencies within the each Centers and all of NASA.

Group facilitation is a process in which a person who is acceptable to all members of the group, substantively neutral, and has no decision-making authority intervenes to help a group improve the way it identifies and solves problems and makes decisions, in order to increase the group's effectiveness (Schwarz, 1994).

For the purpose of this discussion the following definitions are provided:

Information Technology (IT): as defined by the Clinger-Cohen Act of 1996, Sections 5002, 5141 and 5142, is any equipment or interconnected system or subsystem of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information (NIH, 2004).

Enterprise Architecture (EA): is a comprehensive view of what an organization does, how it does it, and how IT supports it. EA is a strategic tool which links an Enterprise's missions and programs to its IT Strategy.

As Is: is a current state, or view of the infrastructures effectiveness, an appraisal of performance, and an assessment of the alignment of IT activities with enterprise and mission strategies.

To Be: is a future or desired State of IT systems that typically are more flexible, less complex and less expensive.

GSFC Enterprise Architecture Work

Center EA

Within GSFC's EA frameworks, IT projects could be aligned with the Agency's EA strategic direction and business plans to realize the value of each investment, as well as take advantage of the opportunities that new information technologies would bring.

EAWG: Who We Are and What We Do

The EAWG worked by consensus and functioned as in-house consultants governed by charter to develop the GSFC Enterprise Architecture.

The Goddard EAWG provided review, analysis, and recommendations. The stakeholders included a Center-wide customer base as well as the Center and Agency CIO's offices, Space Operations, Science, Aeronautics, and Exploration Systems (the former Enterprises), and all those with vested interests in NASA's scorecard performances for EGov, President's Management Agenda (PMA) and Office of Management and Budget (OMB) initiatives.

The working group membership represented the diverse missions of Goddard. The team was comprised of civil servants and contractors representing:

- CIO's office
- Independent Verification and Validation Facility
- Chief Financial Officer's office
- Management Operations/Institutional
- Flight Projects
- Space Science
- Wallops Flight Facility
- Earth Science

EAWG: Tasks and Objectives - NASA Headquarters

Goddard's EAWG was responsible for understanding the Agency's To Be EA strategy, goals and objectives as well as review and comment to the Agency To Be EA documentation: Approach to Design and Implementation.

By committee the working group responded in a coordinated, unified, and timely matter to Agencywide data calls thus providing Goddard an opportunity make sure the center was represented in the Agency's reported plans, to OMB.

Responsibilities to Goddard Space Flight Center

The Goddard EA working Group leveraged an enterprise-wide view of the center to access the feasibility of consolidation and centralization of data, services, systems administration and streamlined resources.

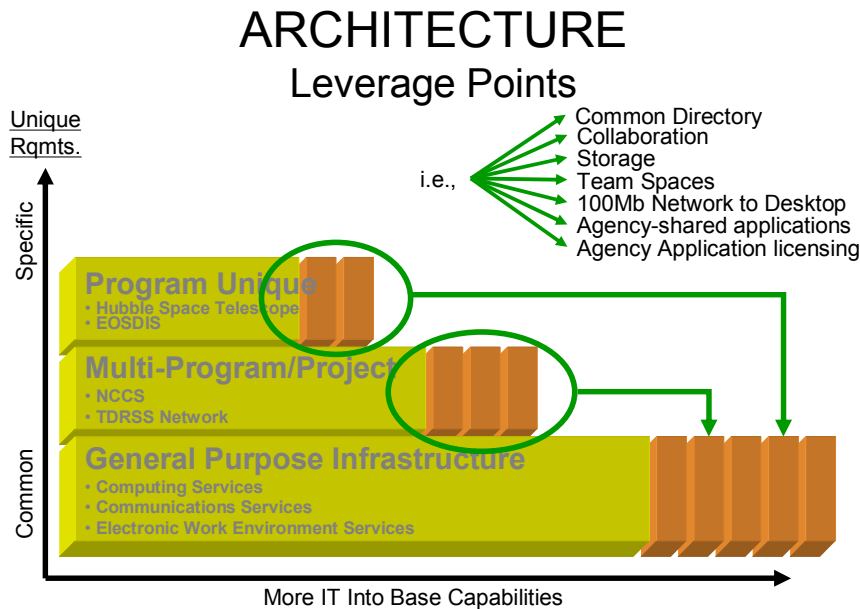


Figure 1: NASA Architecture Leverage Points

The EAWG analyzed GSFC-specific documentation to ensure that Center-wide requirements were addressed. At a center and systemic level the EAWG had a collective understanding of Goddard's:

- Center CIO objectives
- Business Drivers
- Earth and Space Sciences
- Strategic plans

Systems Engineering and Project Management Processes

A systems engineering approach was effectively leveraged to manage the EAWG document-by-committee process. Through the use of 1) facilitation and communication plans, 2) document management and configuration control plans, and 3) project management principles, management both vertically and horizontally within the EAWG team structure were achieved.

The facilitator's communication strategies and documentation allowed the management teams to be coordinated in their approach to participating with the working group.

This method was beneficial when brokering information between the EAWG stakeholders and the EAWG members. It became essential to keep the body at large informed, as to the expectations for the parties involved, as well as gaining clarification on requirements from the stakeholders.

A systems engineering approach also documented best practices which could be leveraged during the next steps that Goddard’s team could undertake in formulating the GSFC EA and corresponding business cases.

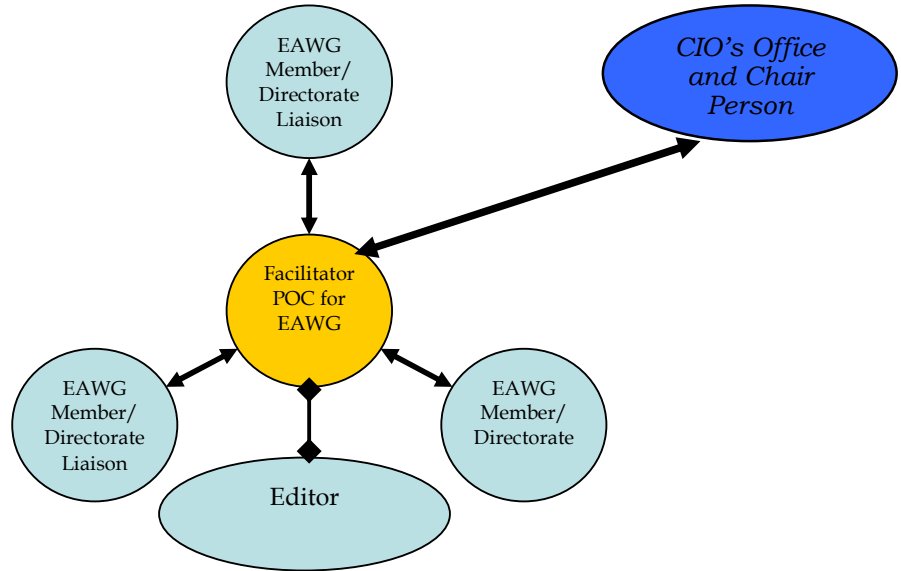


Figure 2: Facilitation Communications Schematic

Project Plan

The purpose of the project plan was to track formulation and revision of “living documents” as they evolved and to assist in the prioritization of work for the GSFC EAWG which coordinated the delivery schedule for the documentation, committee meetings and associated activities, and synchronized the center EA activities with those of the Agency-wide initiatives. Included herein is the 6-month project plan including:

- Work Breakdown Structure (WBS)
- Timeline
- Risk Mitigation Strategy
- Metrics Analysis

Work Breakdown Structure

Chief Information Officer: The CIO will provide requirements, oversight and guidance to the EAWG. The CIO is a customer of the EAWG and the destination point for the deliverables as well as the CIO will also appoint a chair to the working group annually.

EAWG Chair:

- Serve as the GSFC representative to the NASA EA team
- Lead the EAWG

- Provide status reports and presentations to the CIO and GSFC senior leadership as required
- Serve as directorate Liaison

EAWG Facilitator:

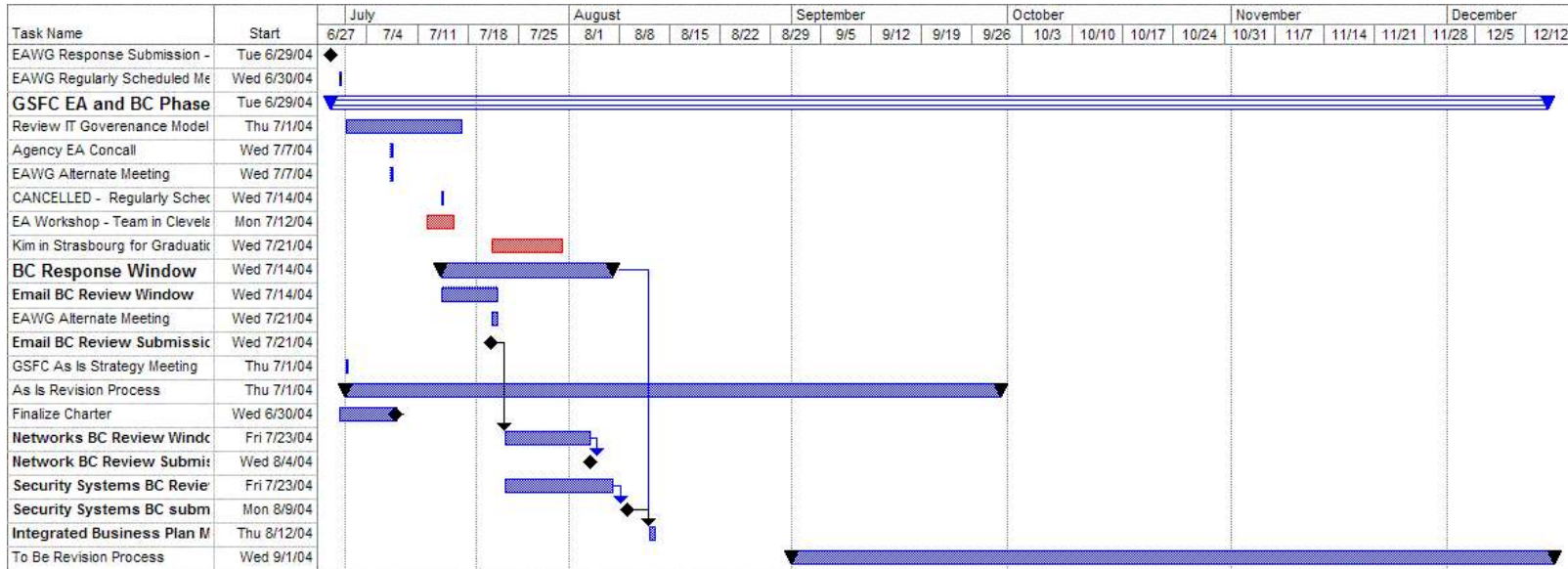
- Facilitate communications, EAWG team participation, and upper management participation
- Coordinate responses and provide configuration and process control
- Team with and serve as EAWG POC to the editor
- Serve as the GSFC representative to the NASA EA team

In absence of named chair person the facilitator will lead the EAWG in alignment with the direction from the CIO's office.

EAWG Members: The working group members are responsible for the content of the enterprise architecture documentation.

- Serve as Directorate POC for the development of both the initial enterprise architecture documents and coordinated responses to the Agency and Center CIO offices.
- Identify incompleteness, inaccuracies, or other problems with the documentation that need to be resolved
- Ensure all enterprise architecture documentation accurately reflects the Goddard Space Flight Center.

Figure 3: GSFC EAWG Timeline 6-month projection



EA and BC Developed concurrently from July 1, 2004 - December 15, 2004
 July 12, 2004 - July 16, 2004, upto 1/2 team out (EA Workshop and/or Vacations)
 July 14 Receive Email BC, July 21 Email Business Case Review due
 July 23 Receive Network BC, August 3 Network BC Review due
 July 23 Receive Security BC, due TBD
 August 12, tentative date for the Integrated Business Plan (IBP) Meeting

Risk Management Strategy

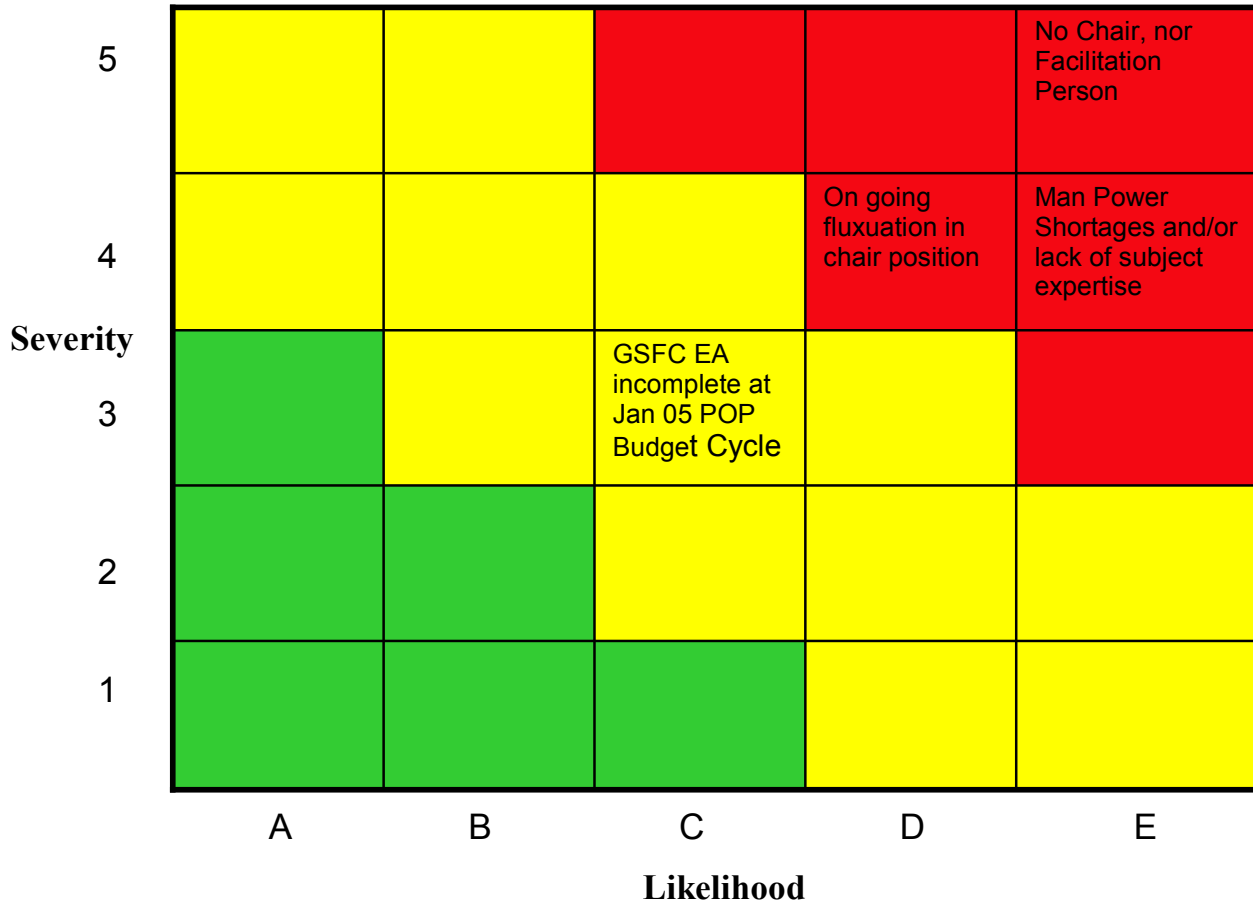
The high risk areas for the EAWG have the ability to significantly impact the quality of collective response of the team, team moral, and responsiveness. Though risk identification and mitigation assessment the following strategy resulted.

Assumptions:

- Assuming stability in the chair role will not be reached quickly
- Assuming current facilitator role expires September 30, 2004
- Assuming parallel approach to GSFC EA revision and documentation process following the business cases
- Assuming current membership

Figure 4: Risk Matrix

Risk Matrix



Risk Mitigation

According to the risk matrix, the biggest risk concentration is located in the red area indicating the most likely and most severe occurrences.

And, are centered on core areas of the team, including:

- Leadership and management issues
- Schedule/planning issues
- Experience/availability of persons working on the projects

Risk management and handling organization issues:

EAWG Chair and/or Facilitator:

- Ensure that risks are identified and undergo a detailed assessment
- Mitigate risks where possible
- Develop the risk management plan
- Conduct periodic risk reviews, assess new risks, and update the risk management plan
- Establish and support a forward planning function to anticipate and prepare for predictable change, and to develop contingency plans to cope with unexpected change

EAWG Members :

- Inform the chair/facilitator immediately as new risks are discovered
- Support the chair/facilitator in the development and implementation of risk mitigation strategies

Schedule/planning issues:

Need to work in parallel, EA and business cases, and As-Is and To-Be, for realistic plan to meet the POP budget cycle; some margins may be built in to catch up with potential delays.

Man power issues:

Staffing needs to be assessed relative to the sufficient number of members, and available subject matter experts it will take for the tasks to be achieved given EAWG work in excess of normal job functions.

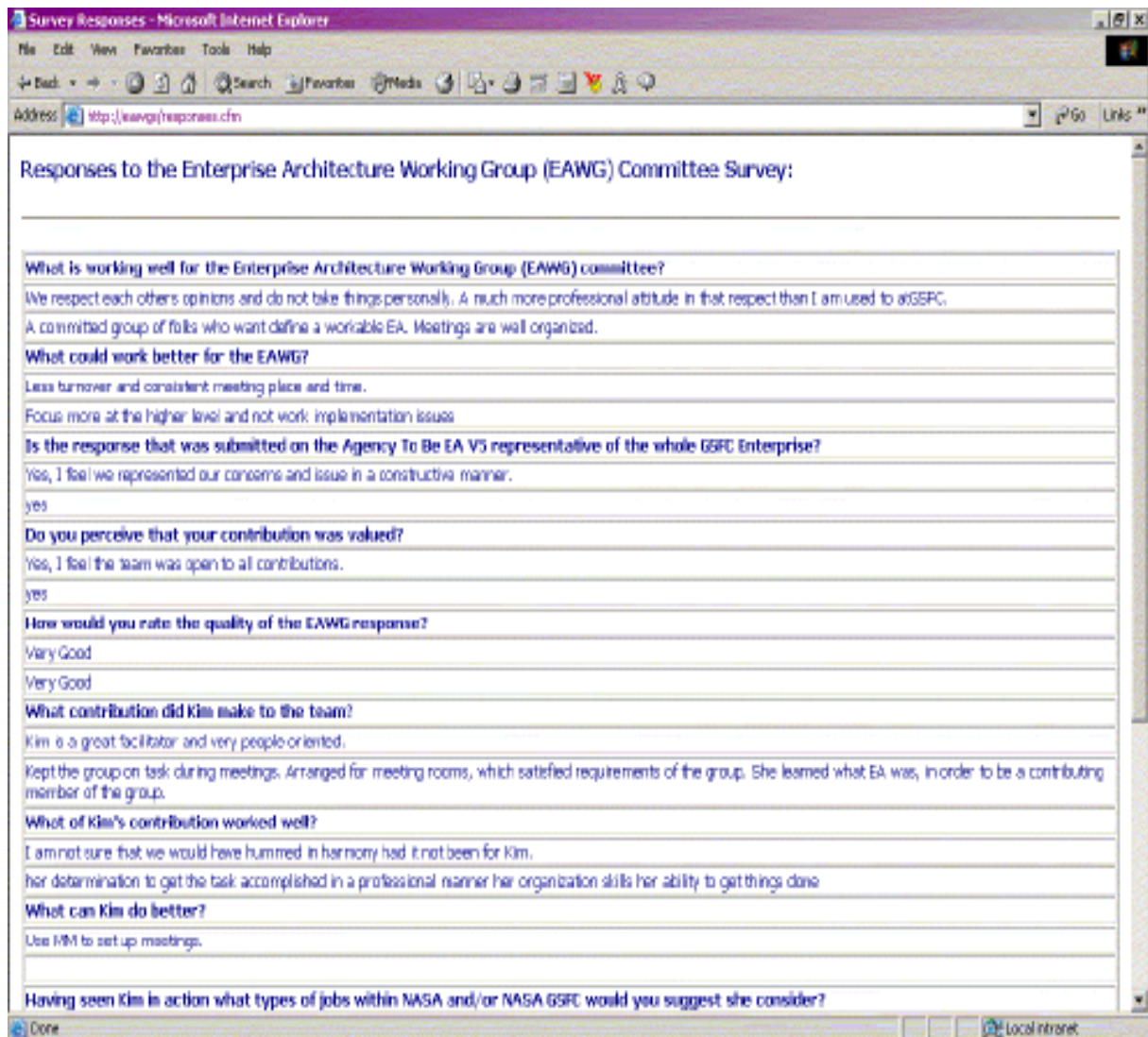
Metrics Analysis

Measure team, processes, and facilitator effectiveness through the implementation of a 360 degree online survey, developed with the assistance of the GSFC Applications Development Branch.

At the heart of improving group effectiveness lies the ability of group members to reflect on what they are doing, in order to create the conditions necessary to achieve their goals. Groups find it difficult to openly examine their behavior on their own; they often need the help of a facilitator (Schwarz, 1994).

Thus, a survey was written to solicit and capture feedback from the EAWG member on both the tangible and intangible results of the committee.

Figure 5: Screen Capture Survey Feedback



Achievements

In addition to the positive feedback received from the 360 degree survey, John McManus, NASA Deputy CIO and Enterprise Architect complimented The Goddard EA working group on its quality of the input and organization of the data in response to the Agency's call for comments.

The three criteria for Effective Groups

- 1) The services that the group delivers or the products it make meet or exceed the performance standards of the people who receive it, use it, or review it.

- 2) The processes and structures used to carry out the work maintain or enhance the capability of members to work together on subsequent group tasks.
- 3) The group experience, on balance, satisfies rather than frustrates the personal need of group members. (Schwarz, 1994)

Work Products/Tangible Outcomes

- Responded to Headquarters EA To Be Volume 5 data call. Delivered Goddard's comments 1-day ahead of the schedule.
- Wrote the EAWG Charter, a governance model for the life of the committee which specifies and guides the members' activities and deliverables.
- 6 Month Project Plan *
- Recorded Facilitation Best Practices

* Herein to this report

Management of GSFC EA Team

Developed an effective working group and witnessed the coming together of the team. From the first time the new facilitator attended, where a group of people came together to discuss their mission, to seven weeks later where the team gelled in it's role to function as a whole and respond to Headquarters on behalf of the center.

The team relied on the guiding documentation provided by the facilitator and trusted the information such that it furthered their contribution to the team.

Team participation

On average, of the 18 EAWG committee members or affiliates, the general meetings drew participation in the range of 8 – 11 persons. The depth and scope of the agenda topics and the effectiveness of the communication plan tactics generally determined the number of people that attended and participated in any given session.

Team ownership

The Agency EA To Be V5 response comments were derived from an 88% enterprise-wide representation. Seven out of the eight GSFC organizations and IV&V contributed comments to the document. Within the iterative process for reviewing and reaching consensus on the comments 100 % of the team had some influence into the final document that was provided to Headquarters.

Trusted Facilitator

Additional responsibilities were added to the facilitator role to represent the GSFC EA team on the Agency EA conference calls. These Agency calls occurred bi-weekly and were attended by representatives from all of the NASA centers, the Agency CIO team, including Deputy CIO, John McManus.

The EAWG committee members relied on the communications of the facilitator to track the collective progress against deliverables and synchronize their calendars on when and where to go for EAWG activities.

Conclusions and Lessons Learned on Developing an Enterprise Architecture

EA

The stay-in-school term provided a chance to learn: 1) Facilitation processes for strategic NASA imperatives, 2) Enterprise Architecture; how it can be an effective strategic tool to link NASA's missions and programs to its IT strategy, 3) the need to strategically manage IT inline with capital assets, investments, and budgetary processes to increase efficiencies within the Center and Agencywide, and 4) included within the EA framework (in addition to the computing infrastructure) is human capital; the personnel that manage the systems.

Document by Committee

Most importantly, the organizations represented on the EAWG could directly be impacted by the Enterprise Architecture framework and resulting IT expenditure restructuring that that this group is reviewing. It is important when working in this fashion to be aware of, and sensitive to the potential attachments that the current IT solutions, processes, methods, and configurations hold for the EAWG members

The NASA and GSFC EA documents are "living documents" that are iteratively written and revised.

Staying the course during changing leadership

The facilitator has increased responsibility during the times of leadership transition. It is important to manage both vertically and horizontally in the interest of moving the team toward the common goal. Conveying messages and influencing the direction of the team through upper management is an effective way to keep the team focused on the deliverables at hand during times when there is no active chair person.

Leveraging collaboration tools

WebEx was used locally during EAWG meetings and for collaboration during the Agency EA conference calls. WebEx allowed all of the Centers and HQ via the internet to view the various files as they were being discussed. Documents were shared, disseminated, and delivered through eRoom an online repository for relevant project documentation. Meeting Maker, another enterprise wide tool can be leveraged for effective communications management, by allowing one to propose, schedule and book meeting locations, from one application.

Acronym List

BC - Business Case

CIO – Chief Information Officer

CNE – Center Network Environment

CPIC – Capital Planning and Investment Control

EA – Enterprise Architecture

EAWG – Enterprise Architecture Working Group

FEA – Federal Enterprise Architecture

FISMA – Federal Information Security Management Act

GSFC – Goddard Space Flight Center

IBP – Integrated Business Plan

GAO – Government Accounting Office

GMC – General Management Council

HQ – NASA Headquarters

NASA – National Aeronautics and Space Administration

NISN – NASA Integrated Services Network

ODIN – Outsourcing Desktop Initiative

OHR - Office of Human Resources

OMB – Office of Management and Budget

PMA – President’s Management Agenda

POC – Point of Contact

POP – Program Operational Planning Budget

ROI - Return on Investment

WBS – Work Breakdown Structure

References

National Institute of Health, (NIH), Clinger-Cohen Act of 1996, <http://www.oir.nih.gov/policy/itmra.html>, July 7, 2004

Schwarz, R.M, 1994, The Skilled Facilitator Practical Wisdom for Developing Effective Group

Appendices

Figure List

Figure 1: NASA Architecture Leverage Points, NASA To Be EA version 2.2, Volume 5

Figure 2: Facilitation Schematic

Figure 3: EAWG Timeline

Figure 4: Risk Matrix

Figure 5: Screen Capture Survey Feedback, courtesy NASA GSFC Applications Development Branch

Quote List

Dr. John McManus, NASA Headquarters, Agency Deputy CIO

Curt Suprock, NASA Goddard Space Flight Center, EA Working Group