



Integrating Program/Project Management and Systems Engineering in Practice

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Abstract. Two practitioners who have experience integrating program/project management and systems engineering conducted two workshops on this subject (will insert the title and venues if paper is accepted). The workshops included presentations by the researchers about their respective integration implementations followed by small group discussion exercises on topics/issues to consider when making integration decisions. Discussion topics were drawn from Rebentisch (Ed., 2017) and included motivations to integrate, organizational environments that support or inhibit integration, influencers and influence, integration metrics, and success and failure contributors. Each exercise concluded with out-briefs of the small groups' observations, analyses, and recommendations to the collective. A synthesis of these observations, analyses, and recommendations provide the bases for this paper.

Introduction and Background

Recently, there has been growing interest in applying systems engineering and project management to complex projects in an integrated way. Since 2011, there has been an alliance team comprised of representatives from the Project Management Institute, the International Council on Systems Engineering, and the Massachusetts Institute of Technology (PMI/INCOSE/MIT) focused on integration at the program level and INCOSE has chartered (in 2016) a Project Management-Systems Engineering Working Group focused on integration at both program and project levels. Both Org 2 (ORG 2) and Org 1 (ORG 1) have taken up this quest, and each have developed what they call their Mission Assurance Program, which describes the integrated application of systems engineering, program (Org 2) or project (Org 1) management, and engineering quality and rigor.

The idea that bringing people from different disciplines together to improve the chances of program or project success is not new, nor is the fact that there are overlaps between systems engineering and project management responsibilities that can create problems if not properly managed. There are domain-specific distinctions relative to the items in the bulls-eye in Figure 1. The systems engineer, for example, has responsibility for technical planning while the project manager has responsibility for budget and schedule planning. The same distinction can be made regarding

risk management: the systems engineer is primarily concerned with product risks while the project manager is concerned with project risks. Of course, technical issues and budget/schedule issues are highly interrelated, hence, the need to integrate the functions. Further, systems engineering and project management share several “soft factors” including the need for practitioners to possess process competence, similar value propositions, and application of processes using a graded approach.

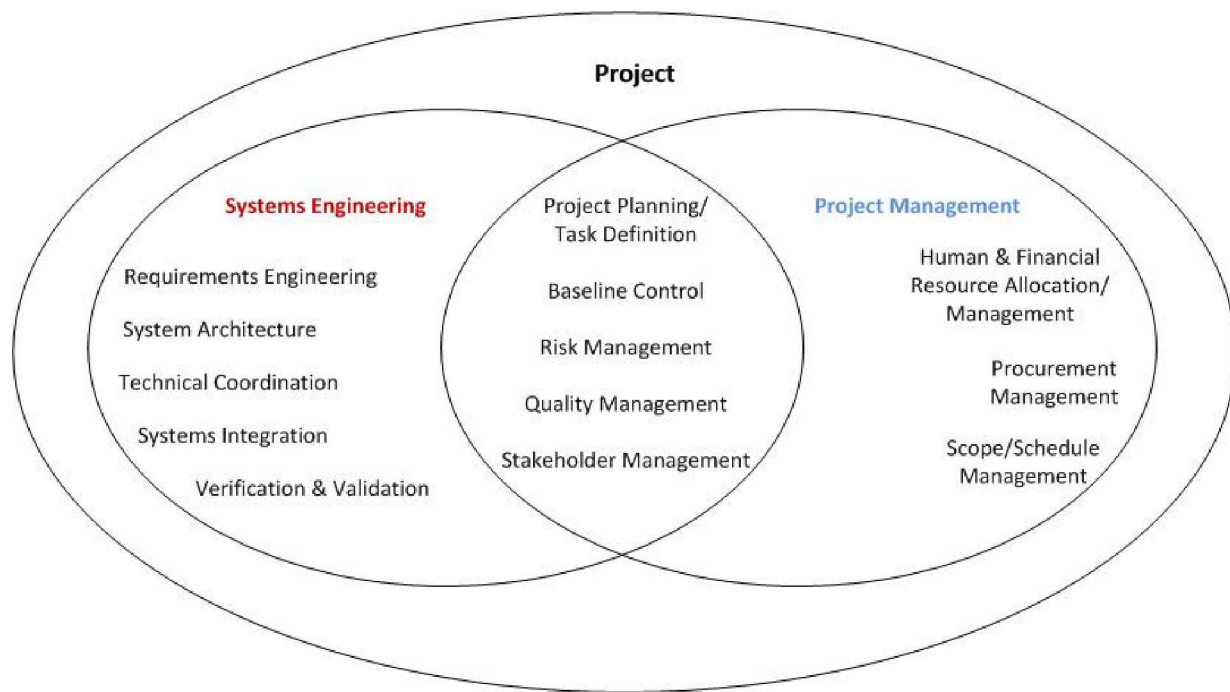


Figure 1. Systems Engineering/Project Management Overlaps. (Adapted from Haskins, 2007.)

As Langley, Robitaille, and Thomas (2011) note, however, achieving such integration (either at the program or project level) is challenging:

While program management has overall program accountability and systems engineering has accountability for the technical and systems elements of the program, some systems engineers and program managers have developed the mindset that their work activities are separate from each other rather than part of the organic whole... As a result, the two groups have applied distinctly different approaches to the key work – managing the planning and implementation, managing the components and their interactions, building the components, and integrating the components (pp. 24-25).

As Mooz, Forsberg, and Cotterman (2003) note, quoting Heinz Stoewer, “Failures not only result from bad hardware engineering, software engineering, systems engineering, or project management, they can also result from differing interpretations of engineering, communications, or management terms and associated cultures.” To ensure that readers of this paper have an understanding of how the authors are using the language of project/program management and of systems

engineering, some definitions are briefly reviewed below. Project/program management definitions are drawn from “A Guide to the Project Management Body of Knowledge” (PMI, 2013). Systems engineering and quality definitions come from Walden, Roedler, Forsberg, Hamelin, and Shortell (2015).

A *Project* is temporary endeavor undertaken to create a unique product, service, or result. *Project Management (PM)* is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. It is distinct from *Program Management (PgM)*, which is the application of knowledge, skills, tools, and techniques to a *program* (a group of related projects and activities managed in a coordinated way to meet program requirements and to obtain benefits not available by managing projects individually).

A *System* is a combination of interacting elements organized to achieve one or more stated purposes. *Systems Engineering (SE)* is an interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem. Systems Engineering integrates all the disciplines and specialty groups into a team effort forming a structured development process that proceeds from concept to production to operation. Systems Engineering considers both the business and the technical needs of all stakeholders with the goal of providing a quality product that meets the user needs.

Quality is the condition achieved when an item, service, or process meets or exceeds the user’s requirements and expectations. It is the degree to which a product conforms to both explicit and implicit requirements. *Quality Management (QM)* is the management activities and functions involved in determination of quality policy and its implementation. It includes:

- *Quality Assurance (QA)*: All those planned and systematic actions necessary to provide adequate confidence that a structure, system, component, or process will meet technical and quality requirements
- *Quality Control (QC)*: Those actions necessary to control and verify the features and characteristics of a material, process, product, or service to specified requirements
- *Configuration Management (CM)*: The change process used for controlling the project scope, design, and associated documentation in an organized manner

Methodology

Two workshops entitled (will insert the title, dates and venues if paper is accepted) were held. These workshops each included:

- A review of project management, program management, systems engineering, and quality management terminology (shown above)
- Presentations by two US organizations (Org 1 and Org 2) describing their respective PM or PgM-SE integration implementations, including the factors that drove the decisions that were made

- Small group discussion exercises on topics/issues to consider when making integration decisions for participants' own organizations, followed by out-briefs of the small groups' observations, analyses, and recommendations to the collective

Syntheses of the observations, analyses, and recommendations were provided to attendees in a written report following the workshops. These reports provide the bases for the discussion and conclusions in the current paper.

Brief Overview of the Case Studies

The National Nuclear Security Administration's (NNSA) national laboratories deliver national nuclear and global security mission solutions. Both Org 2 and Org 1 have an enduring nuclear weapons mission: to provide a safe, secure, and effective nuclear deterrent. Both also have broader national and global security missions, to:

- Protect against the nuclear threat
- Counter emerging threats
- Provide solutions to strengthen energy security

The work spans from basic research to systems development and operation and comes from US government agencies (not only the NNSA, but also the Department of Energy, Department of Defense [DoD], and the National Institutes of Health to name but a few) and non-governmental organizations, through cooperative research and development agreements.

(Will include background about the two organizations if the paper is accepted.)

Both Org 1 and Org 2 have striven to integrate program or project management, systems engineering, and quality under the rubric of *mission assurance*. The DoD (2013) defines mission assurance as an activity that

“exploits multiple overlapping programs that operate cohesively to ensure organizational processes are performed in accordance with the intended purposes or plans. It includes activities and measures taken to increase resiliency of essential capabilities and supporting infrastructure required for the DoD to carry out the National Military Strategy.”

Though they have similar missions, the two laboratories took different approaches to implementing their mission assurance processes. A summary of their approaches follows.

The Org 1 Case

Mission Assurance (MA) is the overarching value proposition that guides R&D project work at ORG 1. The primary motivation for this construct is the belief that the integrated application of SE, project management, and QA leads to an increased likelihood of mission success – delivering the right product, at the right time, on budget. A few successes that turned into spectacular failures that required heroic efforts to recover from and that could have been avoided if SE had been applied also helped motivate the organization, especially as communications with the workforce were rolled out.

A graded approach is very important – neither the type of project being performed nor the funding profile provided by the customer may support the application of very formal processes. To address these challenges, ORG 1 developed and is implementing a Mission Assurance program that applies the concepts of systems engineering, project management, and engineering quality and rigor using a risk-based graded approach. In the workshop presentation, the ORG 1 approach to developing and implementing the Mission Assurance program was described and the policies, tools, and training (aka the MA Framework) that support the diverse set of projects performed across the Laboratory’s mission space was discussed. (For details of the ORG 1 Mission Assurance processes, please see Anonymous 1, 2016.)

The ORG 1 effort started in early 2010 and the first policy document, *Conduct of Engineering for R&D*, which is a systems engineering methodology, was published in late 2012. *Determining Needed Engineering Rigor for R&D*, a risk level determination procedure, was published concurrently. *Project Management for Programmatic and R&D Work* lagged considerably, and was finally published in 2016. So, the mission assurance concept was not “born” whole. Rather, it was the result of an evolutionary process that continues today. Indeed, it was the training development effort that raised awareness that the MA program was not itself integrated. Thus, current efforts are directed at integrating policies and tools into a single Mission Assurance for R&D program description and tool suite, the Mission Assurance Support Tool (MAST).

The Org 2 Case

A focused effort on mission assurance framework development began in 2008 in a major business unit at Org 2. The spectrum of work in this business unit spans basic research to operational system design, development, integration and operations. Every aspect of our work demands our commitment to quality products and services for our customers. Increasingly, many of our programs are growing in scope and complexity. Our customers are demanding a higher level of quality assurance and project management/project control discipline which requires that we respond with a higher level of attention and skill in quality business and technical processes and project management. Consistent with the trends in our customer expectations for more rigor, internal corporate expectations are increasing for: project management; project controls; earned value management; quality; adherence to industry standards such as International Organization for Standardization (ISO) standards; management assurance; and financial controls. Applying the right level of rigor is essential to minimizing waste and increasing efficiency and effectiveness. Too much rigor minimally commits four of the seven waste sins: overproduction of information, waiting (e.g., long approval sequences), unnecessary movement of information, and over-processing of information. Too little rigor results in rework (e.g., incomplete, ambiguous or inaccurate information; uncoordinated tasks).

(For details of the ORG 2 Mission Assurance processes, please see Anonymous 2, 2013.)

Discussion

As can be seen from the foregoing case descriptions, there are both similarities and differences in the Org 1 and Org 2 implementations of mission assurance. (Not all of these may be obvious from

the short case studies, but readers who are interested are referred to the source documents cited above for additional information.)

On the similarities front, both Org 2 and Org 1 have:

- A lack of SE understanding corporate-wide
- Core requirements that cannot be waived, but otherwise allow for tailoring using a risk-based graded approach
- Organizational factors – mission breadth, large campus, tri-lab interactions, distributed engineering functions – that contribute to implementation challenges
- Tools to support implementation
- Challenges with how to collect and share information from their Mission Assurance Frameworks
- Standards-based policies and procedures
- Similar cultures, especially in regard to rewarding heroics
- Influxes of early career hires that can be leveraged during onboarding

Differences include the fact that Org 2's implementation went through a vertical slice (Program Management Unit) of the organization while Org 1's was enterprise-wide.

In addition, Org 2 had:

- Consistent executive leadership champions, willing to “enforce” Mission Assurance practices, with top-down governance from the Vice President level
- A window of opportunity (presented by the contract transition)
- A team of people to develop their Mission Assurance building blocks (ORG 1 had one hero)
- ISO AS9001 as their quality standard (an industry-based [aerospace] standard)

Org 1 had:

- A federated governance model with no clear champion, which required a high degree of cooperation by senior leaders and led to there being (extreme) stakeholder influence
- SE training included in the suite of tools rolled out to the workforce
- ANSI/ASQ Z 1.13-1999 as their quality standard (a research-based standard)

Small Group Discussion Exercises

All exercises were adapted from Eric Rebentisch's (Ed.) 2017 book “Integrating Program Management and Systems Engineering” unless otherwise cited. In each exercise, a bit of context was provided and a question or series of related questions was posed to provoke thought and discussion. Participants were asked to first jot their ideas down on Post-It™ notes individually, one idea per note, then to transfer their notes to flip charts. The group worked as a team to cluster the ideas captured based on similarity of the ideas to one another. They then characterized the clusters, assigning each a descriptive phrase or theme that summarized the grouping. The results of the workshop exercises are described in the remainder of this section.

Because the two workshops had different audiences and because lessons learned from the first workshop were incorporated into the design of the second, the topics of the exercises used at the second workshop (venue to be supplied if paper is accepted) were somewhat different than those used for the first workshop (venue to be supplied if paper is accepted). Those differences will be highlighted in the exercise descriptions below.

Motivations

The context setting for this exercise was the discussion by the presenters of their motivations to take on the challenge of integrating PgM/PM and SE in their own organizations. Because the attendees at the first workshop (venue to be supplied if paper is accepted) were primarily Org 2 and Org 1 employees, the instructors thought that there was little to be gained in terms of diversity of opinion by having an exercise on this topic since the attendees had just been told what the motivations were. The attendees at the second workshop (venue to be supplied if paper is accepted), in contrast, were a diverse group, representing organizations ranging from academia to aerospace.

The prompting question for the exercise was: *What would motivate you or your organization to pursue the integration of SE and program and/or project management?*

While many attendees pointed to the same motivations that Org 1 and Org 2 had with respect to their mission assurance implementations – improved efficiency and effectiveness, balanced with risk and the desire to maintain their reputations for technical excellence with no heroics – there were also a number of additional motivations stated:

- Taking the risk-balancing motivation a bit further, participants from aerospace and other technologically complex industries indicated that when building high risk/high consequence systems, risk aversion is a forcing function. The SE and the Program/Project Manager need a common understanding of what level of risk is acceptable to stakeholders.
- Participants also noted that integration can help promote cross-discipline understanding of SE and PgM/PM and that it provides a common terminology, not only between SE and PgM/PM but also as the “glue” for integrating engineering disciplines.
- Other participants had more strategic motivations. One person, for example, spoke of the value of understanding where there is discretion in program plans that can be leveraged when identifying technology roadmaps.
- Finally, attendees noted that quantitative data demonstrating the value of SE (and, presumably, also of PM) would be helpful in motivating their organizations to apply these disciplines more formally. Both INCOSE and PMI have had efforts to demonstrate the value of their respective disciplines (see, for example, Honour [2013]) with greater or lesser success. One of the difficulties with value metrics is that they are correlational, not causal, in nature – how one proves that project success or project failure was the result of applying or failing to apply SE or PM practices is not straightforward.

Compare and Contrast

In the first workshop (venue to be supplied if paper is accepted), participants were asked to identify similarities and differences in the Org 1 and Org 2 mission assurance implementations. The results of this exercise are presented in the case study overview in the Discussion section.

At the second workshop (venue to be supplied if paper is accepted), participants captured personal reflections (not shared) on how their own organizations are similar to or different from Org 2 and Org 1 as context for later exercises.

Organizational Environment

Organizational environment includes factors such as culture, mechanisms for *collective consciousness* or the mutual understanding of the need to bring together individuals' capabilities in a way that forges an integrative team rather than having star contributors promoting their own agendas, leadership, and interdisciplinary teaming.

The prompting questions were:

- *What aspects of organizational environment support integration? What can be done to reinforce positive environmental aspects?*
- *Which aspects of organizational environment are barriers to integration? What can be done to overcome the barriers?*
- *Would you consider your current organizational environment to be supportive of integration? Why or why not?*

To be successful at integrating SE and program/project management, **the organization must have a culture of excellence** (quality, safety) and continuous improvement that leverages lessons learned, celebrates success, and does not punish failure, but uses it as a learning opportunity.

There also must be a strong business case to start/sustain integration. The business case and subsequent implementation strategy must balance short-term focus (delivering on the immediate project) with long-term strategy (of efficiency, effectiveness, and continuous improvement). The ability to point to demonstration projects in which integration produced positive outcomes is also very helpful. As one participant at the second session (venue to be supplied if paper is accepted) put it “Nothing succeeds like success!”

Those assigned to SE and PgM/PM roles, including leadership roles, must have the knowledge and skills to succeed in the integrated environment. This means that they not only have deep competence in their discipline, but also that they have the professional competencies (see Gelosh, Heisey, Snoderly, and Nidiffer, 2017) related to ethics, communication, negotiation, and team dynamics that are needed to succeed in a multidisciplinary environment. (Leadership qualities are discussed in more detail in the section on influencers and influence below.)

New entry-level hires represent an opportunity to develop early adopters. They should be indoctrinated in the integrated model early and given mentoring and work experiences that help them grow their SE and PgM/PM skills and professional competencies.

Finally, to be successful, **the organization must develop enterprise-wide integration standards** (policies and procedures) **while allowing for scalable, flexible implementation.** Key focal points for achieving and sustaining integration in practice are integrated schedules and planning, and regular meetings.

Influencers and Influence

A *stakeholder* is anyone who has an interest in or ability to *influence* (“the power to produce effects on the actions, behavior, opinions, etc., of others” [Dictionary.com, n. d.]) a project or program outcome, either positively or negatively.

The prompting questions were:

- *Who are the key stakeholders (by role, not name) in your organization who can provide support for integration? What motivates them?*
- *Who are the key stakeholders in your organization who may raise impediments to integration? What motivates them? What challenges would you expect them to raise and how would you address those challenges?*
- *What leadership qualities must key stakeholders have to oversee the integration of SE and PM throughout the life cycle?*
- *If you have had experience identifying key stakeholders and gaining their commitment to change, please describe your experience. What lessons did you learn in the process?*

Not surprisingly, there was a great deal of overlap in the stakeholder sets identified by attendees at the two workshops. Both groups identified senior managers (Directors, Associate Directors, Chief Executive Officers/Chief Operations Officers, and Vice President level managers), the customer(s) and oversight organizations, engineering managers and line/functional managers, program/project managers, and support services such as Finance, Human Resources, and the Project Management Office as stakeholders. In addition, the participants in the second workshop (venue to be supplied if paper is accepted) identified the Board of Directors, systems engineers and technical leaders, project teams, independent reviewers, and end users as stakeholders who could potentially influence integration efforts.

The groups also largely agreed on the **types of stakeholder motivations that would support integration.** These include a desire for continuous improvement in efficiency and effectiveness, for example, through ensuring accuracy of information and consistent application of a common architecture; concern for individual or organizational reputation and the potential for loss of reputation due to poor customer satisfaction; and a drive for success that leads to accomplishing objectives and meeting milestones on schedule and on budget. Additionally, participants at the first workshop (venue to be supplied if paper is accepted) cited financial incentives that reward integration, such as earning performance bonuses, as a supporting factor. Participants in the second

workshop (venue to be supplied if paper is accepted) again focused on high risk/high consequence systems that must work the first time as providing motivation to integrate.

Similarly, the groups agreed on the factors that would be impediments to integration efforts. **The most commonly cited factor inhibiting integration was resistance to change.** Connor (1995) described nine classic factors that contribute to resistance to change: lack of trust; belief that change is unnecessary or not feasible; economic threats; relative high cost; fear of personal failure; loss of status and power; threat to values and ideals; and resentment of interference.

Belief that change is unnecessary is closely related to another inhibiting factor, namely, unawareness of or lack of understanding of the importance of the change. Unawareness can result from silos and organizational boundaries that create barriers to information sharing.

Cost and schedule pressure – the desire to keep costs down and stay on schedule – can also impede the application of SE and PM as well as SE-PM integration. This impediment stems from a belief that SE and PM are not in scope, thus should not be included in the project and/or that the number of processes that must be implemented is excessive (i.e., the implementation is not right-sized).

Leaders of organizations considering integrating their PgM/PM and SE functions **need to be knowledgeable about both disciplines** – this includes being knowledgeable of “industry” standards and practices. They should be “believers” who understand both the value of the disciplines individually and the added value to be gained by integrating them, take a life cycle view, and are data driven.

The leaders must also be able to **manage relationships with discretion and sensitivity and especially to manage customer expectations as the change is being implemented.** Communication about the change is critical – What benefits are expected? What are the short- and long-term costs? What’s in it for me (WIIFM)? The leaders must be able to see different perspectives/paradigms, lead to consensus, attract early adopters, and articulate the value statement. Perseverance and dedication are key.

Integration Metrics

Metrics are quantifiable measures used to track and assess the status of business processes, in this case the integration of PgM/PM, SE, and QM.

The prompts for this exercise, which was conducted only at the first workshop (venue to be supplied if paper is accepted), were:

- *What metrics would you use to determine the level of integration between PgM/PM, SE and QM?*
- *Rebentisch (Ed., 2017) describes three elements of effective integration: rapid and effective decision making, effective collaborative work, and effective information sharing. Does this suggest additional variables that might be worth adding to your list of integration metrics?*

- *What processes, practices, and tools would encourage greater integration between PM, SE, and QM? How would you measure their implementation/penetration in your organization?*

This set of prompts did not generate much in the way of productive discussion, perhaps because participants did not have background or experience in developing business process metrics. They noted that metrics about information sharing and the other elements of effective integration are needed. Larson (2017) suggests six metrics that address this need, specifically, (1) the number of people who participated in the decision, and in addition to Larson's suggestion representation of PM, SE, and other appropriate technical SME roles – five to six is optimal; (2) the number of alternatives considered – four or more options should be considered; (3) the degree of alignment of decisions with business goals – each decision should positively affect five or more business goals; (4) how well decisions were communicated – decisions should be communicated in writing to everyone affected and should include the rationale, the business goals impacted and the names of the people involved; (5) an assessment of how well people buy into the decision; and (6) an assessment of how well the decision turned out.

Success and Failure Contributors

The premise of the tutorial was that integration of SE, PM, and QM leads to increased assurance of mission *success* and that lack of applying SE, PM, and QM leads to increased likelihood of mission *failure*.

The following prompts were used:

- *Think of an example of a project failure and a project success. Consider the contributions of SE, PM and QM or the lack thereof to the outcome. What aspects do you associate with success or failure?*
- *Where have you seen successful integration of PM, SE and QM? Did integration help achieve a positive outcome? Describe the situation and note examples.*

In both workshops, success and failure factors were seen as two sides of the same coin. **Mission success requires good and continuous communication** about the rationale for, impacts of, and engagement in decisions made. Communication between design and manufacturing and between system/sub-system organizations is particularly critical. **Failure becomes more likely when good communication is lacking.**

Poor definition and engagement of stakeholders, including failure to manage the project team as stakeholders (on internal projects especially) and poor management of changes and expectations (regarding scope, schedule, budget and technical requirements), **is another likely cause of mission failure. Stakeholder engagement is key to mission success.**

Mission success also requires strong leadership and leadership accountability. There must be clear lines of responsibility. Poorly partitioned responsibility, in which there are gaps or overlaps between technical management and project management, may result in mission failure. The use of integrated project teams (vs. siloed project and technical teams) is helpful in this regard.

Use of a multi-disciplinary holistic (as opposed to deconstructionist) systems approach – for example, by planning using a lifecycle-focused work breakdown structure rather than a product-focused one – **also contributes to mission success**. Using structured systems engineering tools, and having well-defined and verified requirements, organized and thorough testing including integration testing, and semi-independent (peer) review all contribute to the likelihood of success. Alignment of metrics with business objectives also helps increase the likelihood of mission success.

Discussion and Conclusions

The motivation to integrate project/program management, SE, and quality and rigor can be summed up as follows: **project progress (schedule, budget) cannot be accurately assessed without insight into the path to requirements compliance, the state of project risk items, and confidence that the product is built correctly.**

Organizational environment can support or inhibit integration efforts. For example, an organization in which multi-disciplinary teaming is the norm supports integration, while a siloed organizational structure inhibits it. Other important success factors include a culture of excellence; leaders who see the value of integrating; staff who possess not only deep domain knowledge but also professional competencies that support integration; and policies, procedures, and work practices that foster integration.

It is important to know who the influencers for the integration endeavor are, what they want, and how they can help or hinder the effort. Those leading the integration effort must engage with the stakeholders, taking time to build trust and to understand their needs. Armed with this insight, one can **leverage system advocates** and seek to mitigate risks associated with those stakeholders who are system critics, adversaries, or threats (Wasson, 2006). Applying the integrated processes on a small scale and showing results quickly may be effective in bringing along some of the nay-sayers.

One should look broadly when identifying stakeholders – up, down, and lateral; inside and outside the organization – and remember that authority or position does not necessarily equate to power and influence. Key stakeholders may be hidden or lost on the organization chart.

In making the case for change, **advocates must demonstrate the importance of the change and answer the WIIFM questions for the various stakeholder types**. Advocates must also balance consensus and elevation of issues, working to define options for moving forward by consensus if possible, but elevating the issue in case of stalemate.

Several key themes for successfully integrating PgM/PM and SE emerged from the workshops. All of these themes involve some form of relationship management. Specifically, for there to be effective integration, there must exist:

- (1) a cohesive and dedicated group of subject matter experts (SMEs) who are actively working on the integration effort;
- (2) involvement and accountability of senior management to enable the SME team's effort;

- (3) an environment in which the integration team is acknowledged to have a stake in the outcome and where open communication is a core value; and
- (4) good relationships with customers and other stakeholders.

Thinking to the Future

Both Org 1 and Org 2 have expressed their intent to continue to refine their respective mission assurance programs. Interestingly, though, the organizations are flipping their implementation approaches – Org 2 is now pursuing an enterprise-wide implementation, while Org 1 is looking to get fully implemented in one vertical slice.

Org 1 has revised its policy and procedure documents to form a single program description document, *Mission Assurance for R&D* (which presents an integrated view of PM and SE), and to incorporate both product and project risks in determining needed engineering rigor. However, the revised documents have not yet been released enterprise-wide. Rather, the non-weapons R&D engineering directorate has released a template based on the revised documents to its line organizations with an instruction to develop and adopt in practice a plan to implement the integrated mission assurance procedures on work within their organization. MAST has also been revised and now incorporates the risk level determination element that had been absent in previous versions. A “dashboard” based on Larson’s (2017) recommended decision-making metrics that will track progress on the implementation is under development. Once it is determined that the mission assurance program has been fully (and successfully) implemented in this limited number of organizations, enterprise-wide implementation will be re-considered.

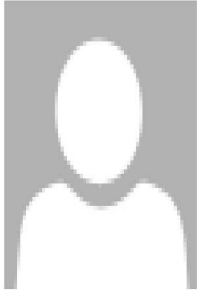
During the process of the current managing contract change, Org 2’s mission assurance framework was identified as a corporate “best practice,” which should be applied at the corporate level. The mission assurance framework team is currently in the process of evaluating requirements for wider-level adoption and institutionalization.

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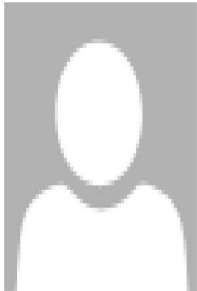
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Biography

For the initial paper submission, do not include this section. For the final paper submission, provide a short biography (50 to 100 words) of each author here and delete these instructions. A small headshot may be included with each biography. The photo's resolution should be at least 300 dpi. The photo size should be approximately 1" x 1.5" or 25 mm x 38 mm.



Author Name. Provide a short biography of the author. Provide a short biography of the author. Provide a short biography of the author.



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