Project Management Training at CIA

Joe Keogh and Richard Roy

Under this initiative, a DS&T senior intelligence officer teamed with two private sector consultants and conceived, based on experience, a revolutionary method of training students in the techniques of project management and systems engineering.

The Project Management Course (PMC) was an initiative by CIA's Directorate of Science and Technology (DS&T) in the 1980s to improve the management of technical projects across the directorate. The learning content was based on lessons from historical CIA development projects and best practices in industry. Under this initiative, a DS&T senior intelligence officer teamed with two private sector consultants and conceived, based on experience, a revolutionary method of training students in the techniques of project management and systems engineering. The course introduced a unique project management model that became internationally recognized and formed the basis of a widely used project management book.

The course and its derivatives had a positive impact on the CIA's project performance. A one-week Directorate of Support course called Managing Agency Projects was based on the concepts of the PMC but tailored to less complex projects. It was taught to hundreds of support officers and received high ratings for its relevance and impact on missions. The PMC also spawned a DS&T Software Project Management Course using applicable project management concepts from the PMC but designed for software projects and taught by computer science professors Richard Fairley and Richard Thayer. The Directorate of Operations' course for managing complex operations developed a project cycle for operations, based on the structure of the DS&T project cycle.

The PMC had a considerable influence on how industry partners and other government agencies worked with the CIA by providing a forum for discourse about the behaviors of each in managing CIA projects.

Origins of PMC

The first PMC was taught in 1989, and ultimately the course was delivered 130 more times until 2001. The two-week course was attended by more than 2,600 CIA, NSA, NRO, and IC staff personnel along with their industry partners. The course was certified as Level III training, meaning that personal interviews in which students proved with evidence that they were applying what they learned to performing their jobs; it was the first course to be so designated.

The course was unclassified and taught in CIA facilities and a conference center in West Virginia. A DS&T office director briefed the students about project management successes and challenges in their components during each course, demonstrating executive leadership commitment for the training and its impact on missions.

The PMC Model

The PMC was built around a model of project management developed by Kevin Forsberg, Hal Mooz, and Howard Cotterman, authors of *Visualizing Project Management* (John Wiley and Sons, Inc., 1996). The book provided clear visualizations of complex processes, simplified understanding of the interaction of the many diverse players involved, and showed how to assess a project's progress. Their companion book, *Communicating Project Management,* provided the first integrated vocabulary of project management and systems engineering. This important addition served to resolve the gaps and overlaps caused by the Project Management Institute (PMI) and International Council on Systems Engineering (INCOSE) separately developing concepts and lexicons.

The model had five essentials.

1. Project cycle containing three aspects (business, budget, and technical).

2. Ten project management elements, each containing the techniques and tools of that element:

   - Project requirements
   - Organizational options
   - Project team
   - Project planning
   - Opportunities and their risks
   - Project control
   - Project visibility
   - Project status
   - Corrective action
   - Leadership

3. Teamwork between the buyer and seller.

4. Integrated project management and system engineering terminology.

5. Management commitment.

During the late 1990s there was increased demand for more non-residential local training to better balance the work and life of employees, and the agency sought options other than two weeks of offsite training. In 2000, the CIA held a competition for DS&T project management training to address this concern. The winner provided the CIA with Project Management Institute (PMI) certified project management training, enabling DS&T staff officers to take local one-week courses and to be nationally certified in project management.

In 2009, a DS&T project management task force led by James Wilkerson and composed of representatives of each office in the DS&T found that PMI based training was not providing directorate officers with an understanding of how to apply the project management principles and theory in the DS&T mission environment and PMI training for the DS&T was terminated. As a replacement, the DS&T instituted a new case-study-based training approach embodying the principles from PMC to develop employee's skills in system engineering and project management. This case-study–based course continues today.

Why PMC?

Two system development cultures existed in the DS&T. There were large, complex, highly visible, and expensive systems expanding the way intelligence was collected, such as KENNEN, a near-real-time imaging satellite system launched in 1976. These large and complex projects could not be accomplished by the CIA alone or by a single company. These projects utilized many documents, sophisticated configuration control techniques, and had significant oversight. DS&T along with its partners in industry had developed techniques that enabled the successful management of these types of projects meeting cost, schedule, and performance.

At the same time, there were many smaller projects in the CIA such as the Tropel camera, for example, which was built by a single person and was so small that it was able to be integrated into many types of concealments such as a pen, a lighter, or a key chain. The camera was made with such precision and unique craftsmanship that it could not be replicated by others. There were companies employing fewer than 10

people working with DS&T officers to build devices such as the "Jack-in-the-Box," a three-dimensional pop-up manikin that would look like a passenger in a car seat. These projects were successful without the full suite of project management and system integration processes needed on the larger more complex endeavors.

During the early 1980s, when the CIA was experiencing a growth in budgets under President Reagan, many DS&T projects were experiencing budget overruns and late deliveries. To address this issue, R. Evans Hineman, the deputy director of the DS&T, asked Len Malinowski to develop a project management training course for the directorate. Len was a senior intelligence officer in the DS&T with more than 20 years of CIA experience managing complex technical projects in the directorate. Len also had industry experience prior to joining the CIA.

Len solicited help from Consulting Resources International (CRI) in San Francisco. Hal Mooz was the founder of CRI, and had a master's degree in in engineering and more than 25 years' experience as a chief systems engineer and project manager at Lockheed Missiles and Space Corporation (LMSC), now Lockheed Martin Corporation. Most of Hal's experience was on CIA projects. Later Dr. Kevin Forsberg joined Hal as a principal in the company. Kevin had more than 30 years of experience as a materials engineer and project manager of NASA's Space Shuttle tile program. Both Hal and Kevin worked with Len to develop the PMC and the three jointly taught the first running of the course.

Len was introduced to Hal at a PM course Hal was teaching at TRW. Len felt the ideas being taught by Hal were consistent with the philosophy of the DS&T and began sharing ideas on teaching project management. Len's concept of a project cycle and Hal's PM elements model along with a repertoire of techniques were combined to form the beginning of a unique PM model.

During the PMC development Hal and Kevin formed the Center for Systems Management (CSM) dedicated to serving the government, industry, and academia in all matters relating to managing complex technical developments. Clients ranged from CIA, NSA, NASA, and Department of State to most CIA partner contractors and academic institutions including George Washington University, Massachusetts Institute of Technology, Stanford University, and the Naval Postgraduate School.

Initially the PMC was jointly taught by these three individuals, enabling the students to gain experienced insight into both the world of industry as well as the Agency. Later, the CIA and CSM added qualified instructors to handle the increasing demand for the PMC. Discourse often evolved into a lively back and forth debate exploring both industry and CIA perspectives and rational for the actions taken by each.

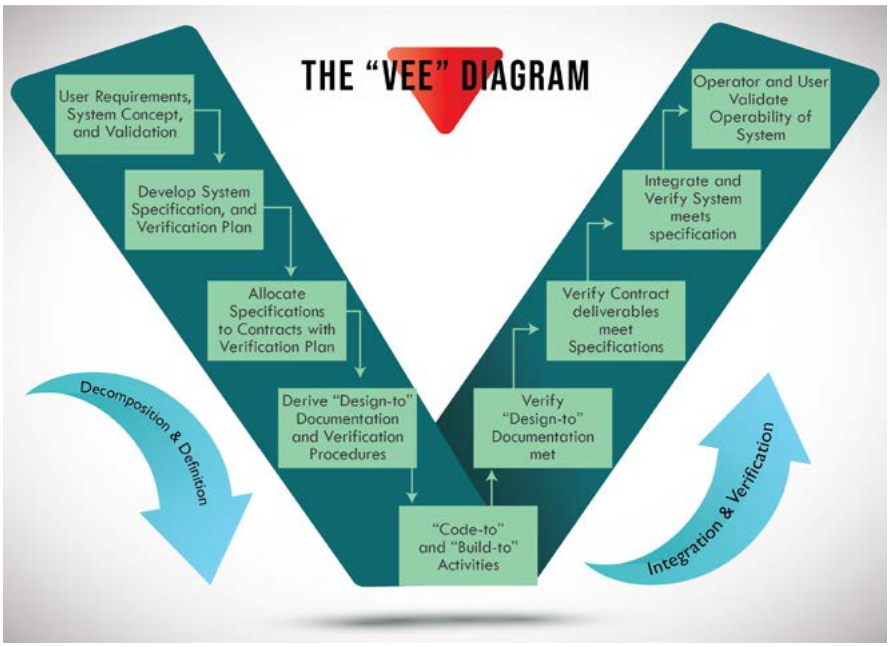
Both Hal and Kevin received a CIA seal medallion in recognition for their unique contribution to project management methodology and to the CIA's mission. The CIA Seal Medallion (now the Agency Seal Medal) is awarded to non-CIA personnel who have made significant contributions to the CIA's intelligence efforts. Hal and Kevin were also awarded the International Council on Systems Engineering (INCOSE) Pioneer Award for their pioneering work.

Unique Aspects

Looking back, a few things distinguished the PMC from general courses.

Government and industry partners (buyers and sellers) jointly attending an in-residence two-week course. The PMC introduced the practice of teamwork through a novel teaching concept that emphasized managing the relationship between the CIA buyer and industry seller. Recognizing the issues caused by a lack of a mutual understanding and differing goals, the PMC trained buyers and sellers together to foster teamwork focusing on mission success. The team focus was on mission success while maintaining a professional, ethical business relationship. To our knowledge the PMC is the first and only course dedicated to improving the communication and understanding of the relationship between government and industry partners throughout the project lifecycle.

This joint training was implemented in three ways. First, the instructor team was composed of an experienced DS&T officer and an experienced industry project manager. Second, CIA officers and their industry development project manager attended the course together, worked class exercises together, took identical final examinations, and shared meals together. Third, the officer–industry pair were provided with living arrangements containing a private area to discuss the application



The Technical Aspect of the Project Cycle, or the Vee diagram, depicts decomposition and integration in the vertical dimension. Decomposition steps break down the overall functions of a system into its smaller parts that can be analyzed and built. An example of decomposition in designing a house would be to identify the functions and needs of each room before construction. Integration is the process of bringing together the smaller components into a single system. An example of integration in building a house would be adding plumbing, heating, and air conditioning to the building. The Vee diagram was first presented in Chattanooga, TN, in 1991 at the first INCOSE convention (then known as NCOSE, it became "International" in 1995). The Vee diagram has since been incorporated into the INCOSE Systems Engineering Handbook and has spread worldwide as the systems-engineering standard.

of their learning experience to their specific project.

The course attendees started skeptical on day one of what value the course could provide them but were vocal with praise at the end of the second week. It gave both buyers and sellers valuable insight for more effective communication and helped gain appreciation of each other's circumstances that could not be obtained in any other way. This was the true uniqueness and value-added provided by the PMC.

Project cycle matched to the best business practices of the DS&T. One of the lessons learned from the KENNEN project was to start a project with a series of studies; including requirements analysis, program definition, and system vulnerability, and to conduct advanced technology development activities prior to commencing acquisition. This was a different approach than most of the technical support to HUMINT operations which was to build something and deploy it quickly to meet the dynamics and urgency of the mission. The most successful CIA projects were ones in which the development team knew exactly what was needed. The effort expended doing studies allowed the development team to understand the operational opportunity or problem and identify the "right" and affordable thing to do to be successful.

The PMC project cycle incorporated this lesson along with additional lessons learned from other DS&T and industry projects. The original cycle contained three periods—study, acquisition, and operations—later updated to four with deactivation as the final stage. The logic used in selecting activities and control gates for the transition from development to operations was based on best practices lessons learned from technical collection operations. The cycle provides control gates to control the progress and manage risk.

A copy of the project cycle was given to each student as a large, fold-out chart that included logically sequenced activities, associated documents, and control gates. Bear in mind this was before the advent of automated dashboards like Tableau. An appendix to the course material contained exemplar documents and guides for control gates as an aid to understanding the context and value.

Tailoring the project management to the needs of the project. Recognizing that projects in the DS&T can have a range of complexities, different motivation factors, and different execution tactics, the project cycle and project techniques included the flexibility to address these differences. Participants were encouraged to tailor or adapt the project processes to the uniqueness of their project and not to follow the project cycle and elements blindly.

Integration of system engineering and project management. The KENNEN project had seven major segments. The development team had the challenge of identifying the necessary systems image quality, feasibility of the concept and how to

partition the system into segments that could be built within industry's capabilities at the time. The development of these multiple segments required different contractor capabilities along with options preserved in each and yet be able to be integrated into a system. Strong system engineering talent in the government as well as project management capability was required to frame and direct the system definition studies.

Once the definition studies were complete the requirements and interface documents had to be updated requiring robust system engineering talent in the government. The development of this system required integrated system engineering and project management on the DS&T and industry sides to build and successfully integrate the seven segments into an operational system. The successful development and operation of this system fostered the integration of system engineering and project management throughout the DS&T.

The integration of system engineering and project management was implemented into the course in two ways: through the technical aspect of the project cycle (the Vee diagram) and through the project requirements that covered all aspects of managing requirements in a systematic and logical way.

Cards-on-the-wall planning technique. Planning is a key part of any project, but difficult to accomplish with a team larger than a few people. The course introduced the Cards-on-the-Wall technique, which used the wall as a planning landscape enabling teams to visibly interact, establish, and challenge the plan.

Periodic corrective action reviews. The course clarified the purpose of periodic reviews used on cost reimbursable contracts by introducing the idea that these reviews have a purpose to keep the project on plan and are more appropriately called "corrective action reviews." This requires the project have a plan, a mechanism for authorizing activity to expend resources against the plan, reporting project status by comparing activity accomplished to the plan, and then taking the actions necessary to get the project on plan or keeping on plan. Students often commented that action items assigned at the routine "periodic" reviews often do not relate to getting the project back or keeping on plan and become unplanned work that contributes to cost and schedule overruns on completion type contracts.

Active project leadership. Project leadership was emphasized as an active role in managing a project. One memorable Hal Mooz quote: "Project management is not a spectator sport." The image of a symphony conductor was used to convey the important role of the project manager.

Control Gates

Another key innovation introduced in the course was the use of joint control gates rather than milestones. A control gate was labeled as "a milestone with teeth" meaning a decision had to be made at a control gate. The purpose of a control gate was twofold; measure accomplishment and establish an executable plan. Criteria for completing the control gate was established by the government and included in the contract Statement of Work. The decisionmaker was the government project manager who had four options:

- Proceed as planned; all required accomplishments were achieved, and plans are executable.
- Proceed as planned; all required accomplishments were almost achieved, and plans are executable, with minor corrections to be resolved within a set date.
- Redo the control gate after all required accomplishments have been achieved and plans executable.
- Terminate the project.

Industry was expected to provide evidence that the criteria had been met. Control gates were scheduled when the evidence was complete, not at an arbitrary target date. The message was that both government and industry had active roles at a control gate with a joint focus on mission success.

Importance to Stakeholders

One of the PM elements in the model is the project team. The natural tendency is to think about the personnel executing the project, but there are often many additional personnel that have a stake in the project. The course provided insight and tools necessary to involve all critical stakeholders.

The first two phases of a project are typically performed by the CIA system engineer, COTR, and industry contractor. The role of operations and mission data user personnel is typically not well understood, and many times not considered during these

phases. The course provided role definition of system validation for the operations officer and intelligence analyst during these initial periods of a project life cycle.

The transition from development COTR to operations personnel is often "throw it over the transom" behavior. Instead, PMC treated the management of this transition activity as control gates—dubbed readiness and acceptance reviews—with criteria established by the operations officers and intelligence analysts to be satisfied by the COTR prior to transition. The course material was written in engineering terms, but instructors were able to convert this terminology into terms used by the CIA's non-technical workforce using "war stories" and case studies to enable the understanding and application to the entire life cycle of a project.

On the industry side, companies are initially concerned with winning the competition and invest corporate independent research and development funds to increase their probability of winning. The course emphasized the value of integrating system engineering into these early activities and highlighted the need to ensure these activities were on track with what the customer was requiring by utilizing internal corporate control gates with criteria important to the capture team.

The language used in projects is not always understood by the broader industrial and CIA communities. To remedy this, there was a three-day course for executives, partnered with industry senior executive to explain the PM model, terminology, and need for senior management commitment. Executive attendees commented that the executive course allowed them to quickly learn the broad concept of how projects were executed, the logic of the steps, and the language used. They also shared experiences and gained insight into each other's environment. An important aspect for an executive is the critical points to engage with a project and the types of resources needed. Robert Wallace, an experienced Directorate of Operations and DS&T leader, attended the executive course and recounted:

> *The criticality of a positive, mutually respectful COTR-contractor relationship, technical and personal, the lack of which became an element of every project requiring attention.*
>
> *For Office of Technical Services (OTS) project managers, "fluency" in project management was as important to their success as language training was to a case officer being assigned to a foreign county."*

PMC's Legacy

The Office of Technical Collection (OTC) had a mix of projects, some complex and some simple. The challenge the OTC director had was how to consistently apply adequate and efficient PM practices across this mix of projects. Peter Daniher, the OTC director, commented:

> *At some point, circa 1993, enough staff members had been through the Project Management Course to reach a tipping point where the training caught on. There had been enough issues in many small to medium cost programs (relative to the multi-billion satellite development programs) that staff members began to see the value of applying the project management precepts, even if notionally. The gap between no formal oversight processes and full-blown oversight processes gradually closed. Application of project management guidelines on a level suited to the scope and cost of projects became more routine.*

When industry partners returned to their companies after attending the PMC, their positive feedback often prompted their companies to contract with CSM to teach the PMC messages to their internal project teams. This secondary effect enabled partner industries to incorporate PMC techniques for managing projects and to have a clearer understanding of how to work with the CIA.

Project management is a natural partner to all aspects of the agency because it is about doing things and doing things "right." While the joint training has been lost, the value of teamwork to the agency both in its relationships with industry and other entities is an important characteristic and value to accomplishing its mission. These unique PMC practices are key to the CIA project management philosophy, continue to be taught, and will benefit the agency long into the future, especially for today's mission-center structure where multiple cultures must be integrated.

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The authors: Joe Keogh and Richard Roy were staff officers in CIA's Directorate of Science and Technology when they helped develop and teach the PMC during the early 1990s. Both are now retired.