



DELIVERING A HIGH PRIORITY CAPABILITY FOR THE NAVY AHEAD OF SCHEDULE!

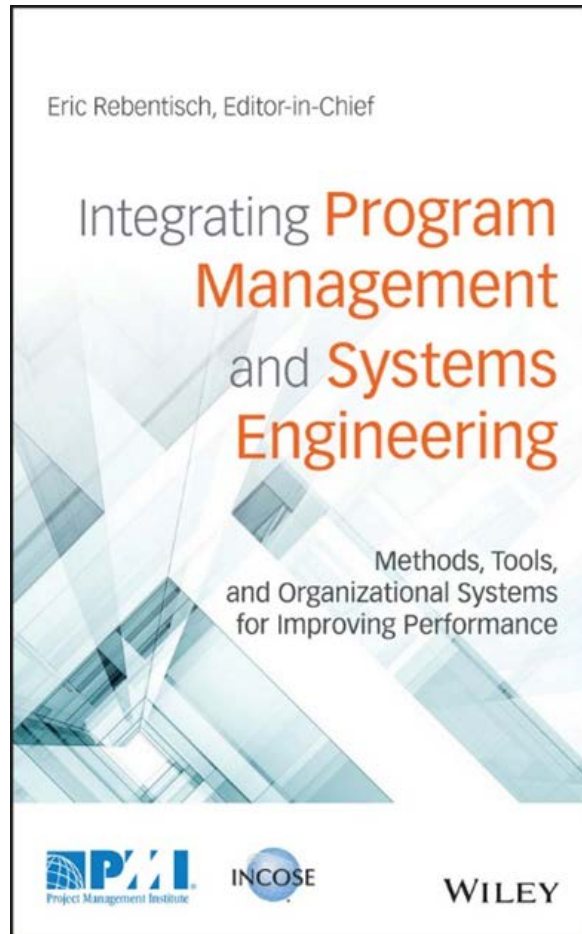
Daniel Keleher, CEA Technologies

Dr Betsy Clark, SCRAM Principal

Electronic Support Upgrade for the Royal Australian Navy's Anzac Class Frigate



Used as a case study in a recently published book

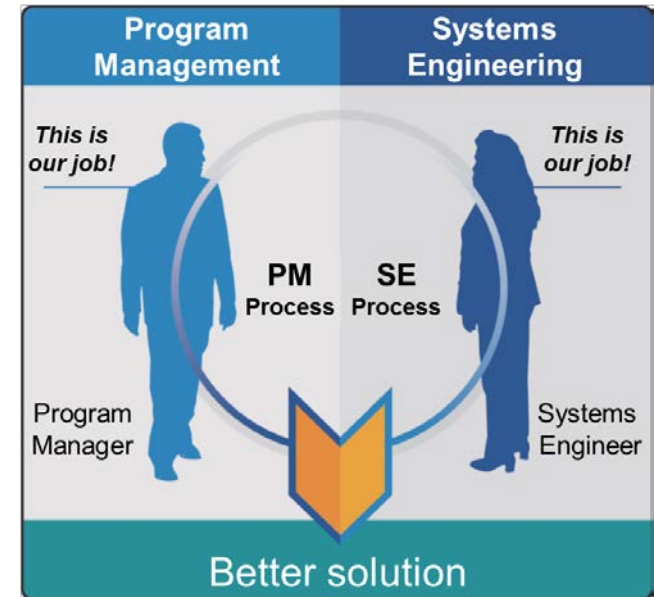


- ▶ Book summarises four years of research by MIT looking at the role of PM and SE integration in program/project success
- ▶ Case study was contributed by SCRAM Principals
 - Betsy Clark, Software Metrics Inc.
 - Angela Tuffley, Redbay Consulting
 - Adrian Pitman, CASG



Vision: Toward a New Mindset of Integrated Program Management and Systems Engineering Disciplines

- Current state: *"...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..."*
- Result: routine failure of complex and large-scale engineering programs to meet cost budgets, schedule, and requirements
- Vision: *"...an understanding that all of the work is relevant to both groups, and that the delivery of stakeholder value requires an appropriate contribution from both areas of professional expertise."*
- Note: SCRAM brings project management and engineering together

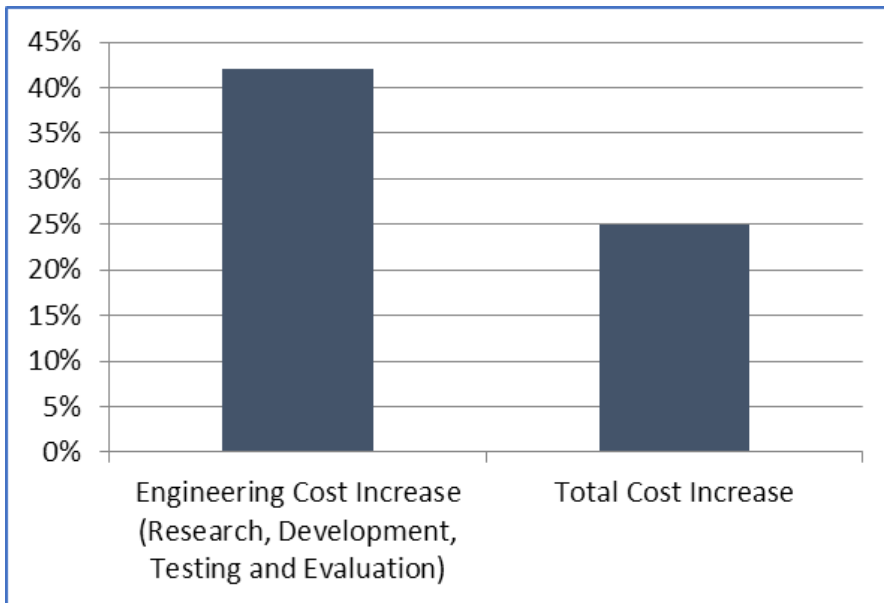


Source: PMI

See: Langley, M., Robitaille, S., & Thomas, J. (2011). Toward a new mindset: Bridging the gap between program management and systems engineering. *PM Network*,

Disappointing Outcomes from Large-Scale Engineering Programs

US Department of Defense Development Portfolio – Change from initial estimate (2008)



- Total cost growth:
\$296 billion
- Average schedule
overrun:
22 months
- Similar situation in other
industries



Integration is...

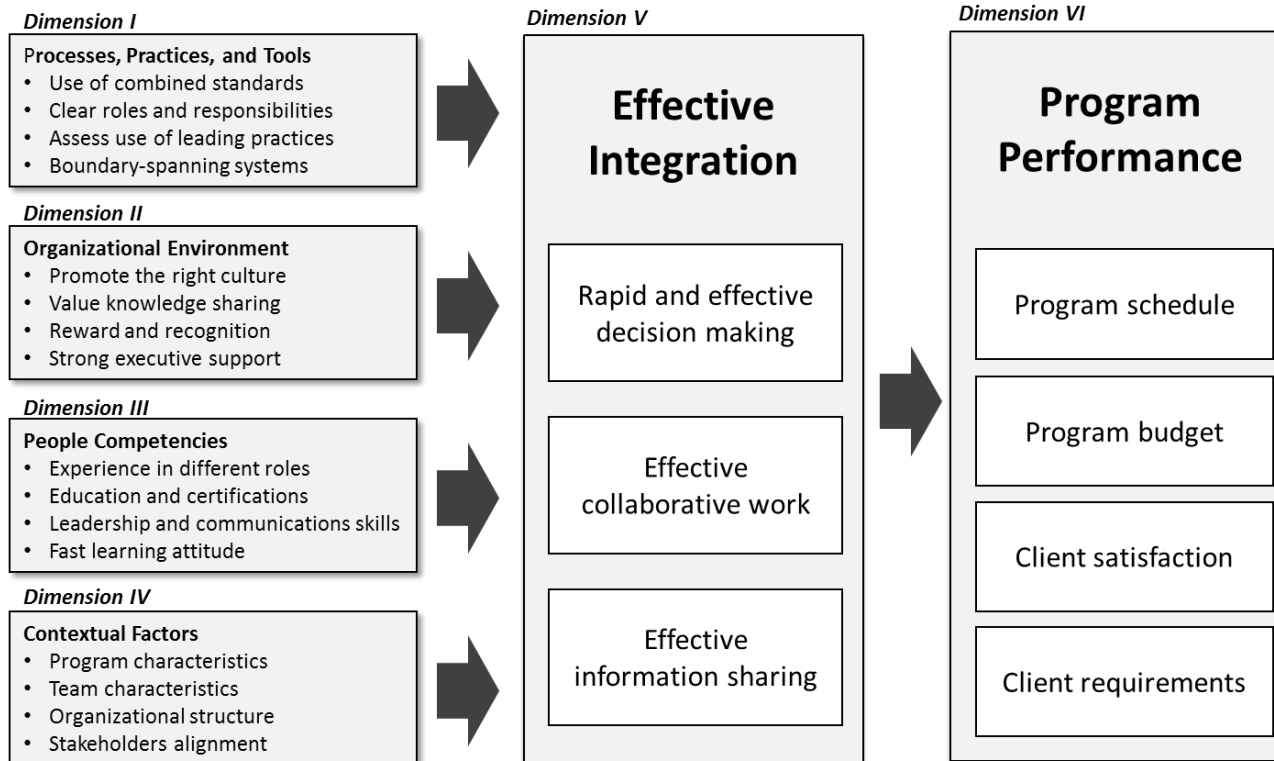
- Having a shared set of objectives defined by the success of the overall effort...
- Everyone knowing what those objectives are...
- Clarity and understanding around everyone's roles and how they contribute to achieving the objectives...
- Respecting the value of the others' role and contribution to achieving the objectives...
- Valuing and promoting “collaboration” over “competition”...



Unproductive Tension Results From...

- Failing to communicate and establish a common set of objectives “vision” shared by all...
- Individuals/groups focusing on achieving objectives defined by their own discipline identity and/or processes...
- Being unable to work together to achieve the globally-superior outcome...
- Not valuing the others’ role and contributions to achieving the globally-superior outcome...

A System View of PM/SE Integration



Two Case Studies

Royal Australian Navy's Electronic Support Upgrade for the Anzac class frigate



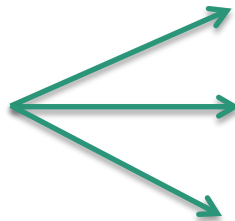
US Navy's F-18 Super Hornet

This will be presented at 11:30

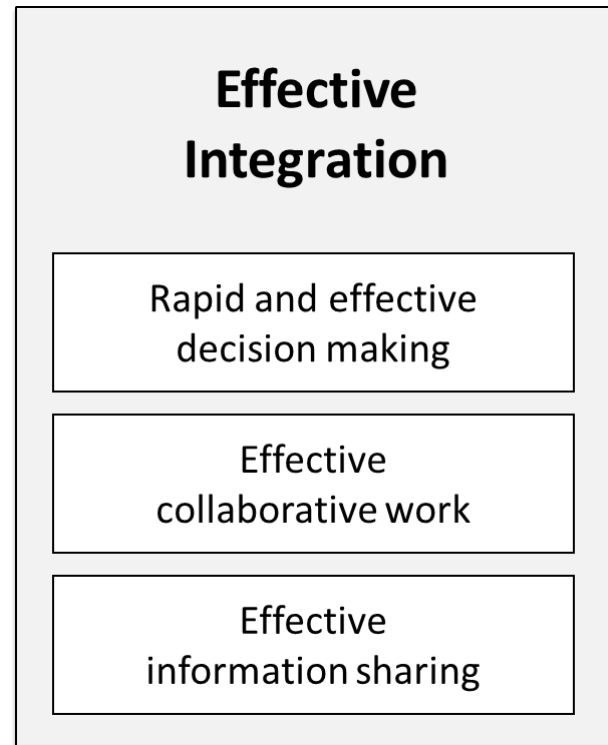


Case Studies

- ▶ Both programs achieved effective integration as evidenced by



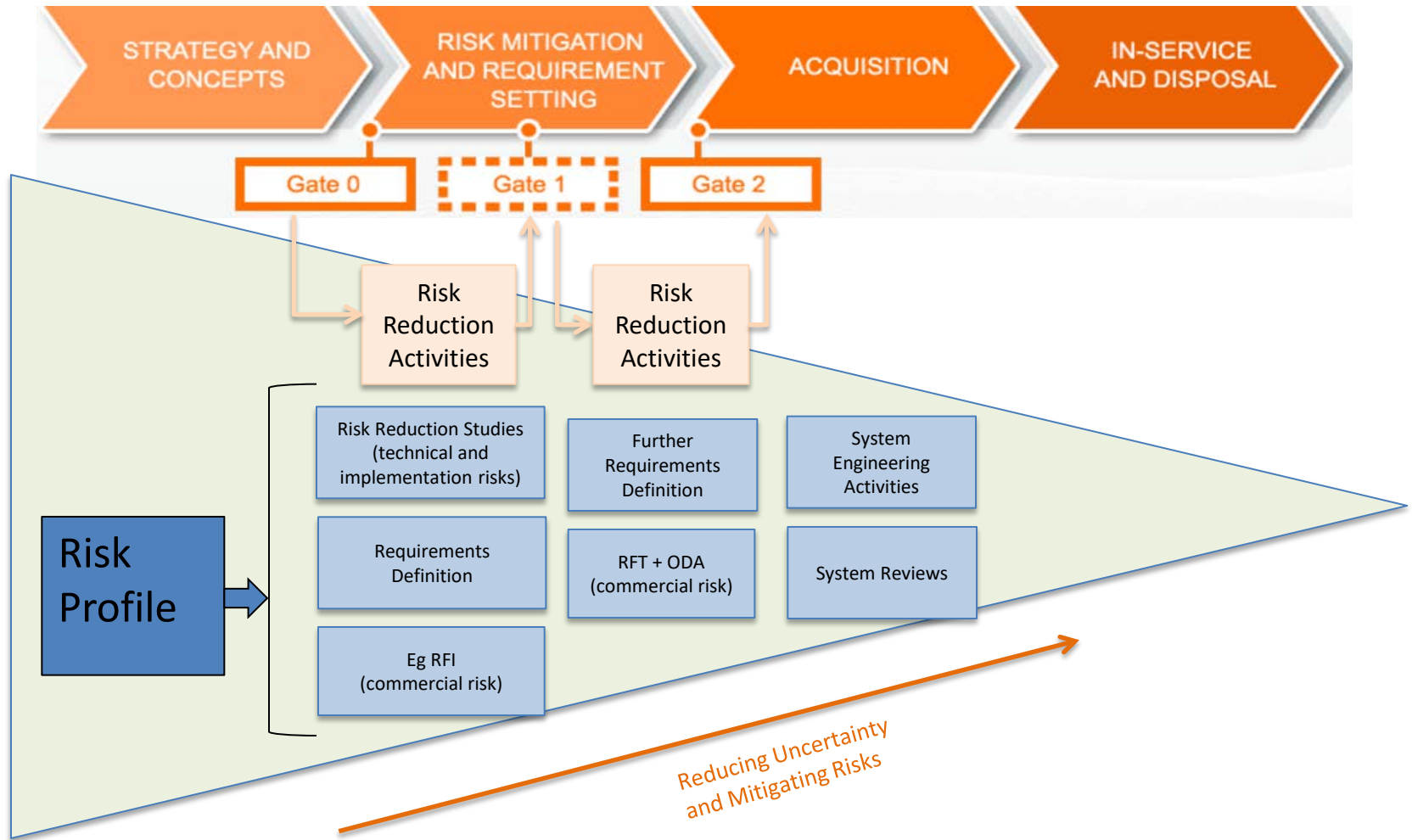
- ▶ They differed in their approaches but both achieved the outcome of a well-performing system delivered within cost and schedule



Electronic Support Upgrade for the Anzac Class Frigate

- ▶ Anzac class Navy frigate was first commissioned in 1996
 - Eight ships operated by the Royal Australian Navy
- ▶ Electronic Support (ES) systems gather information through passive analysis of electromagnetic radiations
 - to detect and distinguish between friendly and adversary emissions and provide warning if an attack appears imminent
 - new system to be acquired and installed
- ▶ One component of a larger domain of Electronic Warfare (EW)
 - Technically complex area
- ▶ The ES upgrade was a high priority of the Chief of Navy
- ▶ The project was under pressure to accelerate system delivery
- ▶ Maritime Electronic Warfare Systems Program Office (MEWSPO) established within the Australian Defence's Capability Acquisition and Sustainment Group (CASG) managed the ES upgrade

Risk Mitigation across the Capability Life Cycle



Setting the Context

- ▶ At First Pass the decision was made to acquire a common ES system across several classes of Navy ships
- ▶ Team of four contractors
 - Exelis (now Harris Corporation) as the prime contractor
 - Jenkins Engineering Defence Systems or JEDS
 - Ultra Electronics
 - Southwest Research Institute (SwRI)
- ▶ Three additional contractors whose activities or systems must integrate with the ES system
 - BAE Systems-Australia (BAES-A) – Henderson Shipyard in WA
 - CEA Technologies
 - Saab Australia
- ▶ In addition, two CASG System Program Offices had to work closely together
 - MEWSPO (overseeing ES system acquisition) and the Anzac SPO (responsible for scheduling and overseeing ship maintenance and upgrades)

Setting the Context (continued)

- ▶ There was a two-year period between selection of the common ES system and full funding approval for the Anzac ships
- ▶ Project obtained funding to support a series of risk-reduction workshops during the two-year period
 - Brought together all seven contractors to identify technical risks and mitigation strategies

Key Risk Reduction Activities

- ▶ Need to Identify Development and Implementation Risks
- ▶ System definition and understanding
- ▶ Installation/Platform Integration complexity
 - Upgrade cycle that was set by Anti-Ship Missile Defence (ASMD) Program
 - Two programs (ASMD and ES) out of sync
 - Time pressures
- ▶ Structural and other issues unknown (antenna mast)
 - Combat system integration (software and hardware issues)
- ▶ Different parts of the system being developed to different timelines
- ▶ Multiple interdependent vendors (Saab, Excelis, BAE, CEA)
- ▶ Continuity of vendor workforce through the different phases of the Defence approval lifecycle
- ▶ Overseas design and production of significant part of system with local platform installation
- ▶ Price and Schedule

Risk Reduction Activities - Outcomes

Define targeted Risk reduction actions

- ▶ Equipment and Combat System vendors briefed each other/ worked together on their respective systems and 'self-organised' through design, development and T&E:
 - Mutual understanding of system features
 - Early clarification of system boundaries and respective tasks
 - Enabled resolution of design factors – optimised design for platform constraints
 - Reduced the risk pricing built into bids – 'discount' that recouped some of the risk reduction costs
- ▶ Partitioned the system so it could be delivered in stages and therefore functionality can be delivered to customer:
 - Three part system (low, wide, narrow band) – agreed to deliver two out of three immediately due to different narrow band development timeline
- ▶ Agreed a FFBNW strategy (prepared vessels: cabling, foundations, cabinet install, combat system console installation) with CN for platforms for which the ES would not be available during refit:
 - This strategy allowed ES work to be undertaken while ships were under refit for ASMD
 - remaining system components could be installed when available
 - Saved time and money
 - This "fitted-for-but-not-with" strategy was possible because of knowledge and confidence gained during the pre-contract workshops
 - Took some risks – some rework but lots of benefits

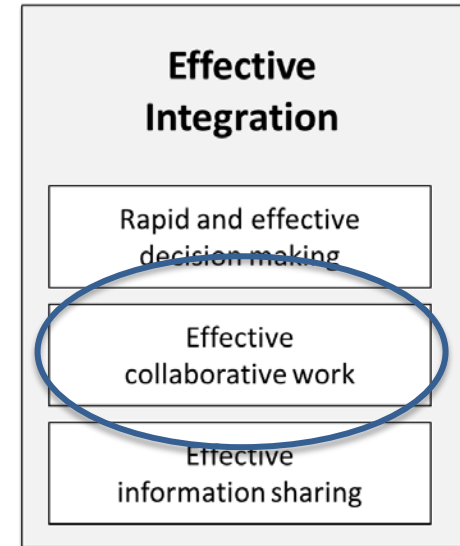
Risk Reduction Activities - Outcomes

- ▶ Continuous engagement with vendors for risk reduction efforts
 - Scheduled risk reduction studies during the typical waiting period for acquisition approval – continued understanding of risks
 - Kept the teams together – retention of knowledge and skills
 - Preliminary design work benefited schedule

- ▶ Defence was the Prime System Integrator
 - Commercially made it possible to leverage off ANZAC SPOs contracts with Saab and BAE
 - Removed the commercial complications of multi-vendor environment

Promoting Effective Collaboration

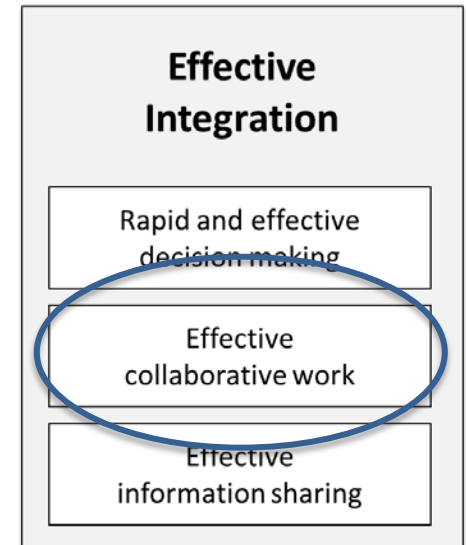
- ▶ The risk-reduction workshops set the groundwork early on for mutual respect and direct communications



“On this project, we were empowered to talk to each other directly with no communication bottlenecks. All the players participated in the workshops. We were drawing boxes on a white board and talking about how to integrate them without getting too much into the weeds. Dan sat back and let it happen because he could see it was a healthy thing.”

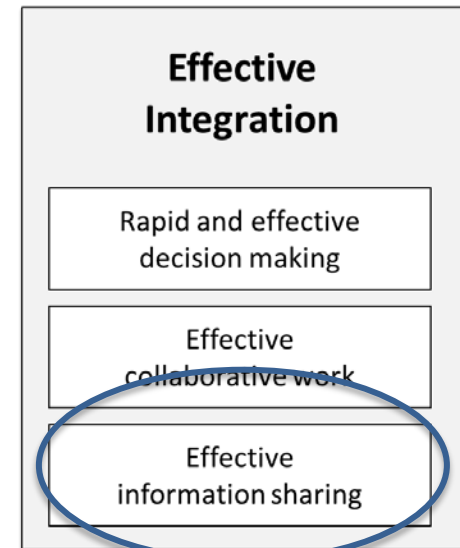
Promoting Effective Collaboration

- ▶ The two government program offices, MEWSPO and the Anzac SPO, worked constructively and collaboratively with each other
 - A Project Implementation Plan clearly defined the roles and responsibilities of each of the SPOs



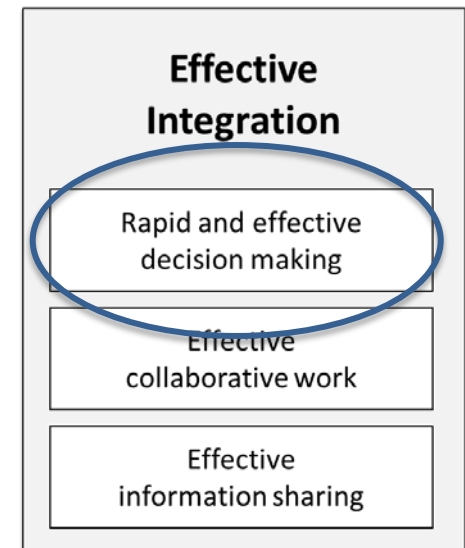
Effective Information Sharing

- ▶ In addition to the risk-reduction workshops and direct communications, information was shared via computer simulations of each of the interfacing systems provided by the system developers
 - Saab for the Combat Management System
 - CEA for the phased array radar
 - Exelis for the ES system
- ▶ These computer simulations allowed any interfacing component or system to be tested early in their development against the simulated interfaces
 - Result was a relatively smooth integration and test of the actual systems



Rapid and Effective Decision Making

- ▶ Demonstrated by the project's ability to adapt to changing circumstances, all the while maintaining a laser-like focus on delivering the capability as early as possible



Anzac ES Upgrade: Case Study Summary

- ▶ Leadership is key

“Dan Keleher understands that his role is to set expectations and let us do our work. He encourages an outcome attitude. He listens to us and doesn’t just tell us what we should do. Throughout the entire project, Dan has worked with us rather than against us. There have been times we’ve called him at 11:00 at night...Gary Crawford [Chief Engineer] has an amazing amount of experience and competency. He’s very hard working but also relaxed. When he walks in, everyone calms down. We can always talk to Gary or to Dan about anything.”

Postscript

- ▶ On June 6, 2016, the ES capability installed on the Anzac class was approved for initial operations by the Chief of Navy after completing a successful series of sea trials and operational testing

Royal Australian Navy's Anzac Class Frigate

Integration Practices	
<p>Integration Processes, Practices, and Tools</p> <ul style="list-style-type: none"> • PM/SE leadership sponsored early risk reduction workshops from 7 different companies delivering systems or subsystems to ensure seamless work • Ensured contractors had direct links with each other to reduce third party bottlenecks 	<p>Organizational Environment</p> <ul style="list-style-type: none"> • PM/SE leaders worked closely to foster a laser focus on the outcome of delivering the required capability • Navy flexed some of its traditional practices to allow for a more agile kick-off that eventually paid off in stronger performance
<p>People Competencies</p> <ul style="list-style-type: none"> • Empowered team demonstrated creative problem-solving and “can do” attitude despite major barriers put in their way • Team members creatively solved problems that emerged as a team, knowing they needed to keep the initiative on track 	<p>Contextual Factors</p> <ul style="list-style-type: none"> • High priority capability directed by the Chief of Navy to be delivered as rapidly as possible. • Leveraged time when ships were taken out of the water for upgrades/repairs and installed “fit for but not with” system components (cables, equipment rack foundations, etc.).



Questions?



A hand is shown from the bottom, holding a white rectangular card. The card contains contact information for two individuals. The background is plain white.

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