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Foundational Learning



Workflow Learning



Performance Learning

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## Introduction

- DOD and Army are focused on technology innovation
- This paper examines best practices and challenges in the state of innovation and technology transition from Research, Development and Engineering Centers (RDEC) to Programs
- The focus is on the efforts at Tank Automotive Research, Development and Engineering Center (TARDEC) and programs under the PEO Combat Support and Combat Service Support (CS&CSS) and PEO Ground Combat Systems (GCS)



# Methodology

- Questionnaire covered several topics
  - Current state of technologies developed in labs
  - Changes required to drive technology from labs to programs
  - Management practices in technology integration
  - Aids and barriers to successful integration
  - OEM/Contractor dependencies
  - Communication and organizational alignments
  - Crossing the chasm from technology development to programs
- Interview subjects
  - Directors
  - Chief engineers
  - Systems and integration engineers
- Practitioners views and experiences



## Discussion

- Current state of technologies being developed in labs
  - Universities, DARPA provide basic research along with applied research
  - Significant applied research applicable to early phases of acquisition cycle from the RDEC
  - RDECs provide advanced development and prototypes to inform requirements for solicitations
  - OEMs, contractors in later phases of acquisition cycle managed by program offices
- Changes required to drive technology into programs
  - Training and Doctrine Command (TRADOC) to drive requirements to RDECs and PMOs supports synchronization between groups
  - Strategic initiatives of Army, versus incremental changes managed by PMOs versus revolutionary initiatives of RDECs must be reconciled
  - POM funding to include funding for transitions



## Discussion

- Program Success in technology transition
  - Successful integration definition must include informing requirements in addition to transitioning specific development into programs
  - Metrics to capture all the value of RDEC efforts need to be defined and captured
  - Integration and transitions must have program owner even for efforts driven by contingency requirements
- Aids and Barriers to successful integration
  - Successful integration driven by demand from PM functions for risk reduction efforts or capability improvements
  - Efforts focused on contingency requirements, urgent fielding requests, and controlling sustainment costs result in successful integration
  - Strong personal relationships between RDEC leadership and PMO
  - Close cooperation required for exploratory efforts to mature and succeed
  - Transition agreements for well defined deliverables can help ensure success
  - PM focus on thresholds versus RDEC focus on objectives results in issues with limited interaction between groups



## Discussion

- Aids and Barriers continued
  - Funding for prototyping, integration, and transitioning must be planned and available
- Participation in technology transfer programs
  - Several programs used
  - SBIR and SBTR used extensively
  - JCTD used on trailer program
  - FCT on Howitzer program
  - Agile Integration Development for Light weight track
  - Necessary condition for technology innovation and transition
- Management Practices
  - Roadmap reviews of technology plans
  - Technology requirements and alignment with program requirements
  - Formal collaboration
  - Technology Transfer Agreements or equivalent
  - Metrics to measure success of technology integration



# Discussion

- Management practices continued
  - Several practices in use
  - Requirements reviews
  - 30 year plan review
  - Strategic engagement at the leadership level
  - Long range input from TRADOC
  - System agreements
  - Key success factor is alignment between RDECs and program offices
- Integration Issues
  - PM focused on low risk to meet performance and schedule; RDEC focuses on TRL 6
  - Revolutionary changes may be missed; 5% improvement in platforms can take 10 years
  - Role of integrator
  - Informal requirements can lead to technology demonstrators but integration into Program of Record is open
  - Lack of alignment between RDECs and Program Offices can lead to funding issues



## Discussion

- OEM/Contractor Dependencies
  - 90% of the RDEC transition efforts require integration by OEMs
  - TARDEC prototype integration facility and systems integration lab have led to improved requirements and informed the integration efforts by contractors
    - Active Protection System
  - RDEC funding for prototype development leads to improved solicitation requirements
- Communication and Organizational Alignments
  - Research groups organized by programs
  - Chief Integration Engineer
  - Close collaboration with RDEC driven by Program Office
    - Active Protection System
  - Senior leadership summits
  - SME exchanges





## Discussion

- Crossing The Chasm
  - SME interactions on an ongoing basis
  - RDEC and PMO joint participation in PDR and CDR reviews
  - TRADOC driven requirements short, medium, and long term leading to strategic and tactical plans
  - Support for using consortiums of small and large companies to develop prototypes with commercial technology using Other Transaction Authority
    - Autonomous vehicles
    - Sensor and robotics
    - Artificial Intelligence
  - Targeted funding of transition activities
  - Leadership support



# Literature Review

- The Future of Army Science and Technology Requires Punctuated Equilibrium
  - “S&T focus less on technology transition and more on proving the value of technology through prototyping and requirements validation”
- DASA RT
  - “Align S&T and develop strategies which provide technology insertion points to programs of record”
  - DASA policy requires Transition Agreements for all Advanced Technology Development, Advanced Component Development and Prototypes, and Manufacturing Technology Development projects
- Bridging the Valley of Death
  - Transition Confidence Levels similar to Technology Readiness Levels measures transition projects from uncertainty to completed transition
  - Data driven standardized approach to measuring the progress of technology transitions



## Conclusions

- Many organizations play a role in technology innovation; RDECs support the realization of the innovation and its transfer to programs
- Symbiotic relationship between RDEC, PMOs, and OEM/Contractors
- RDECs need to extend their reach to non-traditional companies to drive technologies and capabilities – use of OTA
- Integrated requirements between TRADOC, RDECs, and PMOs
- RDEC value in many forms – prototypes, requirements, process improvements
- Funding coordination and availability is critical
- Integration and transitions must have program owners in both RDECs and Program Offices who are aligned and in agreement
- Communications at the strategic level, collaboration of senior leadership and subject matter experts is required for transition success
- Operational view of a process for technology transfers



# Technology Innovation and Transition A System View

