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Interim Analysis: Challenges and Opportunities to Support an Agile Science and Technology Business Strategy and Transition Framework

by Latasha Solomon

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Interim Analysis: Challenges and Opportunities to Support an Agile Science and Technology Business Strategy and Transition Framework

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DEVCOM Army Research Laboratory

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The Army is currently faced with operating in an environment defined by rapid global technology growth compounded with multiple global conflicts. As a result of acquisition cycle timelines, bureaucracy, and inadequate talent management, defense organizations are challenged in adequately delivering technology at a speed and scale to counter emerging threats. This report is the second in a series that seeks to identify agency-specific challenges and alternate solutions to implement an effective, sustainable ARL business model for consideration to address timely science and technology transitions. It is envisioned that this framework will allow for the continuous, seamless transition of knowledge products and technology to operationalize science and facilitate Army overmatch.									
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1. Introduction

This study, ARL 23-101, seeks to identify best practices and the root cause of challenges associated with the U.S. Army Combat Capabilities Development Command Army Research Laboratory S&T transition strategy and the mission to win the competition to operationalize science for transformational overmatch. This effort considers the experience of DEVCOM Army Research Laboratory's internal stakeholders: competency leads, branch chiefs, and technical subject matter experts. The outcome of this study is critical to informing the direction of future research efforts as well as current and future ARL policies and enhancing business framework specific to ARL S&T transitions whereby increasing the number, rate, and impact while simultaneously minimizing resource waste.

2. Methodology

Study participants consisted of two categories. The first were those individuals who were aware of ongoing efforts and volunteered to participate. The remainder consisted of randomly selected participants who were invited to participate via email. Participants spanned multiple roles and technical competencies to minimize bias in responses. Approximately 30 Army Research Directorate (ARD) technical staff were contacted to participate with a positive response rate of 23% representing 4 of the 11 technical competencies.

Verbal informed consent was requested by all participants to participate in the study. To protect the privacy and confidentiality of participants, no data was shared in its raw form. All responses have been analyzed by the principal investigator where general findings are summarized to contain no personal identifiers. To ensure the privacy of responses, each participant was provided a unique identifier defined as a combination of the following, where responses were self-selected:

- **Title:** Scientist and Engineer (SE), Team Lead (TL), Branch Chief (BC), Division Chief/Competency Lead (DC/CL)
- **Length of Service with ARL:** A) 0–5 years, B) 6–14 years, C) 15 years or greater
- **Competency:** Biological and Biotechnology Sciences (BBS); Electromagnetic Spectrum Sciences (EMSS); Energy Sciences (ES); Humans in Complex Systems (HCxS); Mechanical Sciences (MS); Military Information Sciences (MIS); Network, Cyber, and Computational Sciences (NCCS); Photonics, Electronics, and Quantum Sciences (PEQS); Sciences of Extreme Materials (SEM); Terminal Effects (TE); Weapons Sciences (WS)

All interviews were conducted via Microsoft Teams. Interviews ranged in duration, lasting approximately 1–1.5 h where eight open-ended questions specific to transition were discussed as noted in the appendix. The definition of “transition” can vary widely among different groups and organizations. For this study, transition is defined at three different levels (Solomon 2023) where the focus was primarily on Levels 2 and 3:

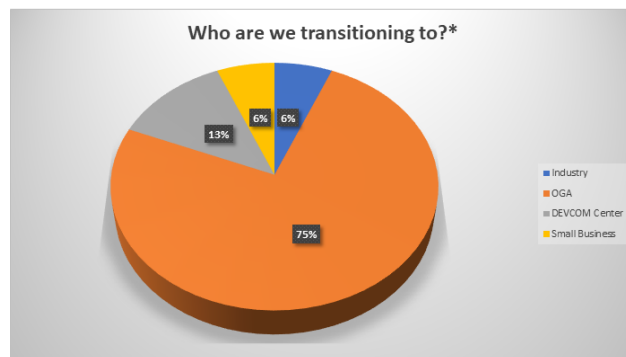
- Level 1: Knowledge Transfer (publications, patents, etc.)
- Level 2: Technology Transfer (Technology Readiness Levels [TRLs] 2–5 to DEVCOM Center, other government agencies, industry, etc.)
- Level 3: Technology Transition (TRLs 6–9 to DOD acquisition program, Urgent Capability acquisition, etc.)

3. Key Research Findings

Several key research findings were identified and briefed to ARD Office of the Director leadership staff and shared with counterparts in ARL’s Research Business Directorate Technology Transition Office to increase the collective impact of those actively pursuing common goals.

Within the past 3 years, nearly 80% of ARL Level 2 and 3 technologies transitioned to private industry, whereas less than 15% transitioned to a DEVCOM center. Figure 1 depicts summary statistics for those interviewed, where it should be noted that branch chiefs and competency leads reported on behalf of all those managed. This infers that the data is representative of a larger population than interviewed.

- **Level 2 Transitions*:**
 - Mean: 1.7
 - Median: 1
 - Mode: 1
 - Range: 4
- **Level 3 Transitions*:**
 - Mean: 1
 - Median: 1
 - Mode: 0
 - Range: 3
- **Average Years to Transition**:**
 - Level 2: 3 years
 - Level 3: 5–10 years



*Respective transitions within the past 3 years.

**No statistical significance in response given sex, position, competency or years in service.

Figure 1. Statistics corresponding to Level 2 and 3 transitions of participants.

One key finding is that the definition of transition success differed among those interviewed. Some defined success to be a transition to a stakeholder while others stressed the importance of filling an Army capability gap and producing a product that is beneficial to the Army.

High-performing teams noted that establishing an intimate, long-term working relationship with the customer was the top contribution to successful transitions. Others acknowledged the importance of quickly distinguishing the difference between what may be a good technology and what the Army is willing to invest in and quickly move on.

Barriers to the number, rate, and impact of transitions are noted below:

- **Complex Business Processes:** Participants noted the inability to keep business processes simple where specific emphasis was placed on the bureaucracy associated with approving Form 1 operational security review for documents generated by ARL employees, initiating contract actions, Information Technology, and Authority to Operate. Additionally, it was noted that the lack of secure facilities can contribute to missed opportunities to collaborate, in turn leading to delayed or missed opportunities to transition.
- **Competition vs Collaborators:** Perception that DEVCOM centers view ARL as competitors rather than collaborators. This was also expressed internal to ARL competencies (ARD and the Army Research Office [ARO]).
- **Lack of Knowledge:** Due to a continuously evolving operational environment, several acknowledged that they were not always certain of appropriate stakeholder contacts and process of engaging. Emphasis was placed on periodically getting outside of the lab to learn of stakeholder priorities.
- **Lack of Access:** As a result of siloed operations and disadvantages of hierarchy structure, there was noted a lack of access to external Army stakeholders.
- **Budget Uncertainty:** Several participants expressed the urgency to actively pursue customer dollars to ensure solvency, which has resulted in less focus on mission-funded efforts.

4. Study Limitations

Study limitations include the following:

- Participants represented less than 50% of ARL competencies.
- Participants were limited to primary stakeholders (technical competency workforce). No input was considered from ARL's Board of Directors, ARO, RBD, or external customers, stakeholders, and end users.
- Participants knew they were participating in a sensing session, which may have influenced how they responded to questions.
- Participants responded to questions from memory rather than relying on organizational documents, which may have skewed response.

5. Recommendations and Path Forward

Given the limited study, initial recommendations to support an agile S&T business strategy and transition framework are discussed below.

- Explore varied mechanisms to (1) adequately and continuously educate ARL employees, both technical and business support staff, of evolving Army stakeholders' mission, (2) streamline collaboration processes, and (3) build and sustain trust among ARL and external stakeholders.
- Adopt a transition definition as discussed in Solomon (2023) and link to pay-for-performance (PFP) metrics where employees (scientist and engineers, business support staff, and management) are rewarded for transition teamwork with less emphasis on individual accomplishments.
- Define corporate goals specific to transition strategy with specific emphasis on concept-driven transitions.
- Implement transition agreements linked to transition levels (Solomon 2023) and incorporate continuous stakeholder/customer feedback to improve the impact of value co-creation.
- Encourage cross-center/service details (full/part time) to improve cross-organization trust and increase the likelihood of a successful technology transition.
- Link PFP to transition metrics (scientists and engineers; supervisory positions; and administrative support).

Furthermore, an in-depth, cross-organization gap analysis is planned in FY25.

6. References

Solomon L. Considerations of a sustainable business model for science and technology transitions. DEVCOM Army Research Laboratory (US); 2023 July. Report No.: ARL-SR-0475.

Appendix. Interview Questions

- 1) Given your experience over the past 3 years, approximately how many Level 2 and Level 3 transitions, respectively, have you or those you supervised transitioned? And to whom?
- 2) On average, how many years would you say was contributed to any specific technology transition?
- 3) *Approximately what percentage of your research portfolio transitions at a Level 2 or 3?**
- 4) How do you define and quantify or measure a successful S&T transition?
- 5) What best practices contributed to successful transitions?
- 6) Are there any reoccurring challenges that you encounter that have either delayed or disrupted a transition?
- 7) Is there anything specific that if implemented either from a technical, managerial, or support staff perspective would increase likelihood of a transition
- 8) Is there anything additional you would like to share regarding DEVCOM ARL's mission and ability to transition that may not have already been stated in the responses provided?

*The third question was later discarded as responses varied from 10% to 80%; some participants failed to respond to specific questions but rather provided the total transition rate of a portfolio, including Level 1 transitions.

List of Symbols, Abbreviations, and Acronyms

ARD	Army Research Directorate
ARL	Army Research Laboratory
ARO	Army Research Office
BBS	Biological and Biotechnology Sciences
BC	Branch Chief
DC/CL	Division Chief/Competency Lead
DEVCOM	U.S. Army Combat Capabilities Development Command
DOD	Department of Defense
EMSS	Electromagnetic Spectrum Sciences
ES	Energy Sciences
FY25	fiscal year 2025
HCxS	Humans in Complex Systems
MIS	Military Information Sciences
MS	Mechanical Sciences
NCCS	Network, Cyber, and Computational Sciences
PEQS	Photonics, Electronics, and Quantum Sciences
PFP	pay-for-performance
S&T	science and technology
SE	Scientist and Engineer
SEM	Sciences of Extreme Materials
TE	Terminal Effects
TL	Team Lead
TRL	Technology Readiness Level
WS	Weapons Sciences

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