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A Benchmark Study of Rapidx, an Air Force Contracting Innovation Organization

December 2022

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ACQUISITION RESEARCH PROGRAM
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ABSTRACT

The purpose of this qualitative study is to first conduct a benchmark analysis of RAPIDx, a new, agile, and innovative organization using the Government Accountability Office (GAO) *Framework for Assessing the Acquisition Function at Federal Agencies* for the Department of the Air Force (DAF). Second, this study provides a record of lessons learned from the implementation of the RAPIDx office from July 2018 to September 2022. Our research methodology includes a gap analysis to compare RAPIDx against two of the four cornerstones outlined within the GAO *Framework*. Our analysis also offers insight and visibility into RAPIDx's effectiveness, and it informs our recommendations for evaluating new, agile, and innovative organizations. In particular, we find that RAPIDx had more areas of concern than best practices when compared against the GAO *Framework*. We captured 16 best practices and identified 20 areas of concern. Finally, to aid RAPIDx, we provide six recommended courses of action to address RAPIDx's most significant area of concern, adapt the GAO *Framework* for innovative organizations, and improve the organization's effectiveness going forward.

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LIST OF ACRONYMS AND ABBREVIATIONS

AETC	Air Education and Training Command
AFMC	Air Force Materiel Command
AFPA	Air Force Public Affairs
AFPEO/CM	Air Force Program Executive Office for Combat and Mission Support
AFRL	Air Force Research Laboratory
AI	artificial intelligence
AR	augmented reality
ATID	Air Education and Training Command Technology Innovation Division
B2B	business-to-business
B2G	business-to-government
BAA	broad agency announcement
CONOP	concept of operations
CSO	Commercial Solutions Opening
DAF	Department of the Air Force
DAU	Defense Acquisition University
DIB	defense industrial base
DOD	Department of Defense
DODAAC	Department of Defense Activity Address Code
DPC	Defense Pricing and Contracting
ERP	enterprise resource planning
FAR	Federal Acquisition Regulation
FFP	firm-fixed-price
GAO	Government Accountability Office
J&A	justification and approval
LNO	liaison officer

MBA	Master of Business Administration
NDAA	National Defense Authorization Act
NDS	National Defense Strategy
NOO	notice of opportunity
NSS	National Security Strategy
OTST	Office of the Under Secretary of Defense Transitions Small Business Innovation Research Technologies
OUSD	Office of the Under Secretary of Defense
OUSD(A&S)	Office of the Under Secretary of Defense for Acquisition and Sustainment
PIEE	Procurement Integrated Enterprise Environment
PPO	public procurement organization
R&D	research and development
RDT&E	research, development, test, and evaluation
SAF/AQC	Air Force Contracting
SBA	Small Business Administration
SBIR	Small Business Innovation Research
SCO	senior contracting official
SOCOM	Special Operations Command
STRATFI	strategic funding increase
STTR	Small Business Technology Transfer
TACFI	tactical funding increase
U.S.	United States
USAFWC	United States Air Force Warfare Center
USD(A&T)	Under Secretary of Defense for Acquisition and Technology
VFM	value for money

I. INTRODUCTION

A. PROBLEM STATEMENT

> We must move with a purpose—we must Accelerate Change or Lose… the Air Force must accelerate change in order to remain the most dominant and respected Air Force in the world.
>
> —General Charles Brown (Brown, 2020, p. 2)

As of September 2022, there are more than 30 innovation organizations working throughout the Department of Defense (DOD) to find and transition innovative commercial technologies into future solutions that meet the DOD's growing list of requirements (Massachusetts Institute of Technology Research and Engineering, n.d.). However, since 2019, the Government Accountability Office (GAO) published multiple reports which indicate that there are weaknesses present throughout the DOD's various innovation organizations. Some of their weaknesses include their exposure to foreign conflicts of interest (Government Accountability Office [GAO], 2020b), history of projects compromised by fraud, waste, and abuse (GAO, 2021b), and consistent delays in notifying and issuing awards under the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs (GAO, 2021d).

Moreover, China and Russia continue to invest heavily in their military capabilities to stop the U.S. from projecting power throughout the world (DAF, n.d.). According to one 2020 report, China's recent modernization efforts enabled its military to reach or exceed parity with the U.S. military in certain areas. For instance, China surpassed the U.S.'s shipbuilding capabilities, and China currently boasts the world's largest navy. China also owns more ground-launched cruise missiles than the U.S. military, and China continues to strengthen its integrated air defense systems (Office of the Secretary of Defense, 2020). However, China's modernization efforts are not the sole result of the country's internal innovation efforts. Instead, China's technological successes are aided by its theft of U.S. intellectual property (Department of State, 2020).

In the wake of these threats, AFWERX, the Air Force's leading innovation organization, has received key contracting support from RAPIDx members since 2018. However, RAPIDx's overall performance has not been formally evaluated since its genesis in 2018. This lack of evaluation is problematic, because RAPIDx is enduring a changing landscape. For instance, RAPIDx observed the SBIR and STTR programs narrowly overcome the threat of expiration (Department of Defense [DOD], 2022) and recently dealt with an organizational realignment that moved RAPIDx from Air Force Contracting's Innovation Division to the Policy and Field Support Division. In the end, without the support of the Air Force's newest senior contracting leaders, RAPIDx may be forced to pivot its focus or dissolve before the organization can ultimately improve the communication and innovation culture across Air Force Contracting.

This MBA professional report applies the GAO's 2005 *Framework for Assessing the Acquisition Function at Federal Agencies* (*Framework*) to RAPIDx, which will help the Department of the Air Force (DAF) understand RAPIDx's strengths and weaknesses. However, the GAO has not provided any major updates to its *Framework* since its original publication in 2005. As a result, the GAO's *Framework* may struggle to effectively measure some aspects of RAPIDx, because it is a new, agile, and innovative organization that may prioritize an incentive structure or management style that differs from more traditional acquisition offices. RAPIDx might also weigh the importance of each of the three primary public procurement objectives—transparency, value for money (VFM), and meeting agency requirements on time (Finkenstadt & Hawkins, 2016)—differently than more traditional acquisition offices. Moreover, the DAF's senior contracting leaders could benefit from the lessons learned from this study, and we might identify gaps in the GAO *Framework* that could be improved for future assessments of innovative acquisition and contracting organizations.

In his 2021 interim *National Security Strategy* (NSS), President Joe Biden acknowledged the DOD's need to replace outdated platforms and weapons systems with cutting-edge technologies and capabilities using streamlined acquisition processes (White House, 2021). President Biden also announced that, to address the strategic challenges raised by China and Russia, the Government would ensure its DOD workforce possessed

the skills to "streamline the processes for developing, testing, acquiring, deploying, and securing [new] technologies" (White House, 2021, p. 14). Other leaders echoed President Biden's vision for advancing efforts to fund and develop cutting-edge technologies.

For example, in 2018, then-Secretary of Defense Jim Mattis expanded upon President Biden's strategy when he released the current version of the National Defense Strategy (NDS) (DOD, 2018). In this NDS, Secretary Mattis observed that rapid technological changes are defining the era of U.S. strategic competition against China and Russia, and these technological innovations are constantly changing the character of war (DOD, 2018). Consequently, Secretary Mattis insisted that a "rapidly innovating Joint Force... will sustain American influence and ensure favorable balances of power that safeguard the free and open international order" (DOD, 2018, p. 1). Other Government leaders echoed Secretary Mattis' strategy to maintain the international order.

His successor, former Secretary of Defense Mark Esper, emphasized in a 2020 memo that the DOD needed to free up its time and money to modernize the Joint Force (Secretary of Defense, 2020). Secretary Esper also noted that the DOD's leaders must, "think critically about the optimal application of every dollar in their respective budgets to advance the [NDS]" (Secretary of Defense, 2020, p. 2). Given the "unsustainable fiscal path" (GAO, 2019, p. 2) that the Government is taking, the defense budgets, and the priorities identified within them, complicate the DOD's ability to advance its technological and innovative capabilities alongside industry's modern advancements and current business practices (GAO, 2019). Additionally, the current Secretary of Defense, Secretary Lloyd Austin, addressed the need to build a more resilient defense ecosystem and the need for acquiring new technology faster in his 2022 NDS (DOD, 2022a).

Moreover, the current Air Force Chief of Staff, General Charles Brown, acknowledged the same complications and challenges in his 2020 Air Force flight plan. Like Secretary Mattis, General Brown observed that the emerging and innovative technologies that ensure military competitive advantages no longer originate from within the DOD. Also, like Secretary Esper, General Brown understood that "we owe it to the American taxpayers to examine how [the Air Force] can provide greater value at an affordable cost to the Nation's defense" (Brown, 2020, p. 5). Finally, General Brown noted

that the Air Force needs to ensure that it provides sustainable pathways for innovative ideas, and he warned that a failure to adapt would result in "mission failure and unacceptable risks to the Joint Force" (Brown, 2020, p. 7). The unacceptable risks that the DOD and DAF face can be mitigated by acknowledging and understanding the effectiveness of the government's innovative initiatives and organizations, like RAPIDx.

The DAF also advertises the seven operational imperatives required to both deter conflict and project power against its strategic competitors. The approaches for six of these seven imperatives require innovative acquisition solutions to be realized (DAF, n.d.). Following General Brown's imperatives, other leaders throughout the DAF emphasized the importance of purchasing innovative solutions to ensure national defense and security. For example, every Air Force contracting-related Flight Plan communicates the prioritization and importance of defense innovation (Air Force Contracting, 2021; AFMC Contracting, 2021; Air Force Installation Contracting Center, 2022).

Ultimately, our research seeks to learn from RAPIDx's organizational structure, initiatives, and performance during this modern era of strategic competition. By applying the GAO *Framework* to RAPIDx, this Master of Business Administration (MBA) report will become the first formal evaluation of RAPIDx and serve as an interesting case study that explores a relatively small, yet highly dynamic and growing contract support organization. The best practices and areas of concern captured from our study will help the DAF's senior contracting leaders understand the current state of RAPIDx. This study can also help these leaders implement strategies to bolster the DOD's innovation ecosystem and reinvigorate the defense industrial base (DIB).

B.   PURPOSE STATEMENT

The purpose of this qualitative study is to first assess the acquisition function of a new, agile, and innovative organization using the GAO *Framework for Assessing the Acquisition Function at Federal Agencies* and then provide the DAF with a benchmark study of the lessons learned from the implementation of RAPIDx between July 2018 and September 2022.

C.   RESEARCH QUESTIONS

As of September 2022, there are no benchmark studies that capture the best practices and identify areas of concern that the DAF should take from RAPIDx. In this MBA report, we assess RAPIDx using two of the four cornerstones outlined in the GAO *Framework*. Specifically, we apply the *Policies and Processes* and *Human Capital* cornerstones to RAPIDx, because these two cornerstones help distinguish the most significant characteristics of an innovative organization from those of a more traditional acquisition function. We also assemble a report of the best practices and areas of concern to inform DOD's senior contracting leaders of what management practices, policies, and procedures worked well in the early years of RAPIDx and can be repeated for other new, agile, and innovative organizations.

1.   Primary Research Question

- How well does RAPIDx perform in the *Policies and Processes* and *Human Capital* cornerstones for efficient, effective, and accountable acquisition functions, as identified in the GAO *Framework*?

2.   Supplementary Research Questions

- Is the current version of the GAO *Framework* appropriate for analyzing new, agile, and innovative organizations?

- If necessary, how should the two cornerstones analyzed in this study be reshaped to improve how the Government measures the acquisition function of new, agile, and innovative organizations?

D.   ORGANIZATION OF REPORT

This MBA professional report consists of six chapters. In Chapter II, "Background," we provide an overview of some of the DOD's initiatives aimed at innovating Business-to-Government (B2G) relationships. We also introduce the Air Force's major innovation organization, AFWERX, to frame and explain where the RAPIDx office fits within the Air Force's innovation ecosystem. In Chapter III, "Literature

Review," we identify and explain the three main attributes of effective public procurement organizations (PPOs) and reflect upon the established framework and adaptations for assessing these organizations. In Chapter IV, "Methodology," we explain our qualitative approach, which consists of interview questions derived from the GAO *Framework*. In Chapter V, "Results and Recommendations," we capture RAPIDx's best practices, identify areas of concern, and provide our recommendations for the future state of RAPIDx and the Air Force's innovation ecosystem. Finally, in Chapter VI, "Summary, Conclusions, and Areas for Further Research," we condense our results, conclusions, limitations, and identify areas in which our research can be expanded upon.

II.   BACKGROUND

A.   UNDERSTANDING THE SBIR AND STTR PROGRAMS

Before we can explain what RAPIDx is, does, and does not accomplish, we first acknowledge the history and details of the current SBIR and STTR programs. These two programs are often grouped together and used interchangeably, because the Small Business Administration (SBA) oversees both. To be fair, these programs are similar in many ways. For example, the federal agencies that participate in either of these programs enable small businesses to work on projects for Research, Development, Test, and Evaluation (RDT&E) purposes (GAO, 2021b). Moreover, under the SBIR and STTR programs, all contracts and modifications that are valued below $7.5 million are exempt from the requirement for certified cost or pricing data (Tenaglia, 2021). This feature—not requiring certified cost or pricing data—plays a critical role in enabling small businesses to participate in these programs. Many small businesses lack the time, manpower, infrastructure, or capital to generate the certified cost or pricing data. So, by avoiding this particular requirement, the SBIR and STTR programs provide small businesses with a more approachable entry point into the realm of B2G relationships and government contracting.

Despite their parallels, there are certain distinctions that separate these two programs. Created by the Small Business Innovation Development Act of 1982, the SBIR program continues to play an important role in the DOD's innovation ecosystem and serves four general purposes:

> (1) to stimulate technological innovation, (2) to use small businesses to meet federal R&D needs, (3) to foster and encourage participation by minority and disadvantaged persons in technological innovation, and (4) to increase private sector commercialization of innovations derived from federal R&D efforts. (GAO, 2021b, p. 5)

In contrast, the STTR program did not exist until the Small Business Technology Transfer Act of 1992 built upon the SBIR program's four purposes and created the STTR program to fulfill a fifth purpose, which was to "foster technology transfer through cooperation between small businesses and research institutions" (GAO, 2021b, p. 5). Thus, the STTR program distinguishes itself by requiring small businesses to work together with research

institutions (GAO, 2021b). When grouped together, though, the SBIR and STTR programs help foster the commercialization of the U.S.'s scientific and technological innovations (Small Business Administration [SBA], n.d.).

As amended, the Small Business Act mandates that certain portions of each federal agency's research and development (R&D) budget be invested in these programs, should they meet certain thresholds. More specifically, if a federal agency's extramural R&D budget exceeds $100 million, then that agency shall ensure that 3.2 percent of its budget goes towards funding SBIR contract awards for small businesses. Also, if a federal agency's extramural R&D budget exceeds $1 billion, then that agency must ensure that an additional 0.45 percent of its budget is reserved for the STTR program (GAO, 2021b). Table 1 displays the eligibility requirements for small businesses to participate in the SBIR program, whereas Table 2 shows the eligibility requirements to participate in the STTR program.

Table 1. Eligibility Requirements for the SBIR Program. Adapted from Air Force Materiel Command Contracting (2016).

To participate in the SBIR Program, a firm must:
1. Have a place of business located, and primarily do business, in the U.S.
2. Be (a) at least 51% owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the U.S., or (b) be a for-profit business concern at least 51% owned and controlled by another for-profit business concern at least 51% owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the U.S.
3. Be a for-profit small business of 500 or fewer employees.
4. Perform work in the U.S.
5. Perform a minimum of 2/3 of the effort in Phase I and a minimum of 1/2 of the effort in Phase II.
6. The Principal Investigator must spend more than 1/2 of the time employed by the proposed firm, which precludes full-time employment with any other entity.

Table 2.   Eligibility Requirements for the STTR Program. Adapted from Air Force Materiel Command Contracting (2016).

To participate in the STTR Program, a firm must:
1. Have a place of business located in the U.S. and primarily do business in the U.S.
2. Be (a) at least <u>51%</u> owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the U.S. or (b) be a for-profit business concern <u>51%</u> owned and controlled by another for-profit business concern at least <u>51%</u> owned and controlled by one or more individuals who are citizens of, or permanent resident aliens in, the U.S.
3. Be a for-profit small business of 500 or fewer employees; there is no size limit on the research institution.
4. Partner with a U.S. research institution, e.g., university or college, federally funded R&D center, or non-profit research institution.
5. Perform work in the U.S.
6. Perform a minimum of 40% of the work and the research institution a minimum of 30% of the work in both Phase I and Phase II.

Both the SBIR and STTR programs consist of the same three phases, and traditionally, every contracted solution funded under these programs begins in Phase I. For this first phase, federal agencies release solicitations in response to an agency's publicized need to conduct "feasibility-related experimental or theoretical [RDT&E]" (Air Force Materiel Command [AFMC] Contracting, 2016, p. 7). The motivation behind issuing a Phase I award is to determine whether the proposed solution with commercial potential holds "scientific and technical merit and feasibility" (GAO, 2021a, p. 4). The total contract value for Phase I awards generally ranges from $50,000 to $250,000 but may be as high as $275,766 without a waiver. The period of performance for these contracts lasts up to six months for SBIR programs and one year for STTR programs (Small Business Administration [SBA], n.d.). The risk and responsibility for managing the costs of performing on these awards falls more upon the contractors, since Phase I contracts are firm-fixed-price (FFP) (AFMC Contracting, 2016).

In an effort to increase the number of proposals received from nontraditional businesses, the Air Force expanded the times it released solicitations for the SBIR and

STTR programs. Previously, the Air Force SBIR/STTR Program Office solicited proposals for these programs twice a year: once for the SBIR program and once for the STTR program (AFMC Contracting, 2016). Today, the Air Force's AFWERX AFVentures Division manages this function and announces focus areas through its Open Topic solicitations and solicits for Phase I solutions three times per year, with each solicitation spanning 30 days (AFVentures, n.d.-a; AFWERX, 2020). Since implementing its Open Topic approach in 2018, AFWERX now receives over a thousand proposals per SBIR solicitation (Maue, 2021). For example, in its first full year using the Open Topic approach, AFWERX received 1,567 more proposals than the DAF received in the previous year (Hart, 2022). During this time, AFWERX awarded more contracts to businesses at lower amounts, typically $50,000 for each Phase I contract, when compared to the Air Force's previous SBIR process (AFVentures, 2021; Gist, 2020). AFWERX's Open Topic approach also resulted in its participants realizing a 29.6% increase towards achieving commercialization versus the previous approach (Gist, 2020). Despite the increasing popularity of Open Topic solicitations, there is an exception to the requirement that small businesses must enter the SBIR or STTR program through the Phase I process.

Beginning in 2011, this exception, known as the "Direct to Phase II" program, empowered federal agencies with the option to skip the first phase of the SBIR and STTR programs, reducing the time it takes for small businesses to transition innovative ideas and to commercialize solutions (Department of the Air Force [DAF], 2022). This pilot program, which is still in effect, encourages small businesses to execute contracts for the Government through the SBIR or STTR program, so long as the small businesses identified possess an innovative solution whose feasibility has been determined outside of the Phase I program. Feasibility documents include, but are not limited to, technical reports, test data, performance results, and prototype designs (DAF, 2022).

Regardless of the route taken, small businesses and federal agencies use Phase II to build upon Phase I RDT&E efforts and work towards developing a prototype. Also, unlike Phase I awards, the Air Force typically awards cost-type contracts for Phase II solutions (AFMC Contracting, 2016). These cost-type contracts normally have a contract value of around $750,000, but the ceiling price for Phase II awards can go up to $1,838,436 without

waivers. Moreover, the period of performance for Phase II awards generally lasts two years (SBA, n.d.). For the first 26 years of the SBIR program, this innovation effort ended in Phase II for most small businesses.

However, on 8 December 2008, these programs transformed when then-Deputy Under Secretary of Defense for Acquisition and Technology (USD(A&T)) James Finley signed a memorandum establishing and authorizing the DOD's use of SBIR Phase III contract awards to promote the commercialization of innovative technologies (Finley, 2008). In this groundbreaking memo, Secretary Finley created a phase that he stated, "derives from, extends, or logically concludes efforts performed under prior SBIR funding agreements" (Finley, 2008, p. 1) and drives those previous efforts toward commercialization. To help push solutions towards the commercial market, Phase III of the SBIR program reduces some of the barriers experienced in the first two phases. For example, federal agencies no longer need to re-compete the requirement or process a Justification and Approval (J&A) document to limit competition for acquisitions in this third phase, because the work completed under the first two phases satisfies the statutory competition requirements (Finley, 2008). Therefore, the DOD can leverage these innovative solutions without being hamstrung by the red tape that often hinders many government RDT&E efforts.

There are other aspects to consider when understanding the distinction of and purpose behind the use of Phase III contract awards. Unlike the first two phases, Phase III awards are not funded by the SBIR and STTR programs (SBA, n.d.). Therefore, any DOD contracting office may award a Phase III contract, resulting in more flexible contracting pathways that incentivize small businesses' decisions to assume risk in developing and commercializing innovative technology solutions. Furthermore, federal agencies may award Phase III awards resulting from either Phase I or II contracts (AFMC Contracting, 2016). Federal agencies can also award a Phase III contract as either a FFP or cost-type contract. Lastly, all awards under Phase III are classified as SBIR awards, even if the technology started out as a STTR award (AFMC Contracting, 2016).

More recently, in June 2020, the DOD established the Office of the Under Secretary of Defense (OUSD) Transitions SBIR Technologies (OTST) program (Office of the Under

Secretary of Defense for Acquisition and Sustainment [OUSD(A&S)], 2022). This program seeks to reduce the time needed to transition SBIR- and STTR-funded solutions into major defense programs. In particular, the OTST program focuses on accelerating the technologies that directly support the warfighter in hopes of preventing these new technologies from falling into the *Valley of Death* (OUSD(A&S), 2022). We address the *Valley of Death* concept in Section E of this chapter.

Overall, the SBIR and STTR programs address the DOD's need for identifying, developing, and assisting the commercialization of innovative solutions during this era of strategic competition. These programs continue to generate value to the warfighter. For example, some of the technologies resulting from these programs leverage artificial intelligence (AI) and augmented reality (AR) to enhance warfighter safety (White House, 2022). Additionally, in 2022, the DOD reported that every dollar invested into the SBIR and STTR programs returned an average of $22 to the U.S. economy (White House, 2022), generating a total economic output of $347 billion since 1999 (OUSD(A&S), 2022). Despite this strong return on investment, small businesses are participating in the SBIR and STTR programs at a historically low rate (White House, 2022).

Finally, the authorization for the SBIR and STTR programs was set to expire on 30 September 2022. If these programs were not reauthorized, then the DOD would no longer be able to fund new or ongoing SBIR or STTR projects (DOD, 2022b). Congress almost let these programs expire while its members fought over some key aspects of the reauthorization bill. For example, some members of the Senate Small Business Committee voiced their concerns that the SBIR program enabled certain companies, known as "SBIR Mills," to receive multiple SBIR awards without ever commercializing and progressing their technologies into Phase III. Some members of Congress fought for updated language to help secure the SBIR and STTR programs from Chinese influence. Other members of Congress debated whether these programs should limit how long a company could participate in these programs, and they considered restricting the number of SBIR contracts that could be awarded to a single business (Matory, 2022). After concluding negotiations, on 20 and 29 September 2022, the Senate and the House of Representatives, respectively, passed a bill to reauthorize the SBIR and STTR programs until 30 September 2025. The

president later signed this bill into law on 30 September 2022 (SBIR and STTR Extension Act of 2022, 2022).

B.   COMPETITION AND THE AEROSPACE DEFENSE INDUSTRIAL BASE

The U.S.'s aerospace DIB consists of all the small and large businesses that provide the DOD with aerospace-related products and services (Lopez, 2022). When understanding the health of the aerospace DIB, many government officials look towards the state of competition. In particular, the DOD values competition amongst small and large businesses, because competition results in lower costs to the government, improved performance by the contractor, and incentivizes contractors to innovate. For instance, when contractors perform under a competed contract, they must work effectively and efficiently to remain competitive for future contracts. Competition also indicates the industry's capability and capacity to develop and deliver the DOD's required services, systems, and technologies (Lopez, 2022; OUSD(A&S), 2022). However, the state of competition in the aerospace DIB has been trending downward over the past half century (OUSD(A&S), 2022).

For example, in the final two decades of the twentieth century, the U.S.'s aerospace DIB experienced two waves of consolidation, as shown in Figure 1 (Commission of the Future of the United States Aerospace Industry [CFUSAI], 2022). This report noted that the first wave, which took place between 1980 and 1991, saw 75 companies trim down into 55 companies. This decade captured the reduction in defense spending and aerospace investments as the Cold War came to an end. Many layoffs, mergers, and acquisitions ensued from this reduction in defense spending, because the aerospace DIB relied more upon defense sales than they did commercial sales during this time period (CFUSAI, 2022).

Then the second wave of consolidation occurred between 1991 and 1999, with the impetus of consolidation resulting from President Bill Clinton's policy on industry consolidation (CFUSAI, 2022). This policy tried to balance and reconcile the shrinking defense budgets that followed the Cold War era by supporting a smaller DIB that possessed fewer defense assets (Deutch, 2001). As a result of the Clinton administration's consolidation policy, the landscape of the aerospace DIB irreversibly changed. The 55

aerospace defense companies that entered the second wave of consolidation shrank further until five major defense contractors remained: Boeing, General Dynamics, Lockheed Martin, Northrop Grumman, and Raytheon (Commission of the Future of the United States Aerospace Industry, 2002). These businesses dominate the modern aerospace DIB.

Lockheed Martin
GD Ft. Worth
MEL Defense Systems
Sanders Associates
Lockheed
GE Aerospace Business
Martin Marietta
Gould (Ocean Systems)
GD Space Systems
Honeywell (Electric-Optics)
Fairchild Westan Systems
Loral
Goodyear Aerospace
BDM International
Librascope
LTV (Missile Business)
IBM Federal Systems
Unix (Defense Electronics)
Comsat

L-3 Communication

Lockheed Martin

Boeing
Hughes Electronics Satelite
Jeppensen Sanderson
Hughes Helicopters
McDonnell Douglass
Boeing
Argo Systems
Litton Precision Gear
Rockwell International - Aerospace
Automatic

Boeing

Raytheon
Marine Sys Grp of Allian Tec
CAE Link
Magnavox Electronics
GD (Missile Business)
Radiffusion Simulation
Hughes Aircraft
GM (Hughes Aircraft)
Corporate Jets
Raytheon
E-Systems
Chrysler Tech Airborne
TI Defense

Raytheon

Northrop Grumman
Avondale Industries
TASC
PRC
GI Defense
Litton Industries
Varian (Solid State Elec.)
Sperry Marine (Storage)
Grumman
Northrop
Voight Aircraft
Westinghouse Defense
Syscon
Logicon
Geodynamics
Ryan Aeronautical
Comptek
federal data
Steering Software
Aerojet
Newport News Shipping
TRW*

Northrop Grumman

General Dynamics
Princess Technologies
GTS Govt Systems
NASCO Holdings
Teledse Vehicle Systems
Bath Iron Works
Cesna Aircraft
Chrysler Defense
General Dynamics
Ceridian's Computing Devices Int'l
Defense & Anament Sys
Advanced Technology Sys
Gulf Stream Aerospace
K-C Aviation
Galaxy Aerospace
Motorola Info Sys Group

General Dynamics

1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001

FIRST WAVE | **SECOND WAVE**

* Merger Pending Approval

Figure 1. 20 Years of Aerospace Industry Consolidation. Source: Commission of the Future of the United States Aerospace Industry (2002).

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As seen in Table 3, these top five defense contractors received a combined total of $119.7 billion in FY2019 and $166.8 billion in FY2020 (Hartung, 2021). For context, these five defense contractors received 19.43% of the entire base defense budget for FY2019 (Office of the Under Secretary of Defense (Comptroller) [OUSD(C)], 2019) and 26.34% of the entire base defense budget for FY2020 (OUSD(C), 2020). Given this disproportionate share of the defense budget, Boeing, General Dynamics, Lockheed Martin, Northrop Grumman, and Raytheon strongly influence the pace of defense innovation. Moreover, when considering their incentives and risks, these five companies spend the majority of their internal R&D money on incremental innovations versus more risky and disruptive innovation initiatives (GAO, 2020a).

Table 3.   Total Money Awarded to Top Five Defense Contractors in FY2019 and FY2020. Adapted from Hartung (2021).

	FY2019 Total Value ($ Billions)	FY2020 Total Value ($ Billions)	% Change
Boeing	15.6	21.7	28.11
General Dynamics	16.5	21.8	24.31
Lockheed Martin	47.1	75.2	37.37
Northrop Grumman	14.2	20.3	30.05
Raytheon	26.3	27.8	5.40
Total	119.7	166.8	28.24

Business consolidations reduce competition and generate sourcing risk. Therefore, many public sources indicate that the DOD wants to see more small and large businesses entering the B2G realm and sparking competition amongst each other. Without sufficient competition, businesses generally lose the pressure to innovate, which can ultimately result in higher costs and greater mission risk (Lopez, 2022; OUSD(A&S), 2022).

C.   DEFENSE CSO PROGRAM

''Innovative'' means (1) any technology, process, or method, including research and development, that is new as of the date of submission of a proposal; or (2) any application that is new as of the date of submission of a proposal.

—U.S. Congress (National Defense Authorization Act [NDAA], 2016, p. 315)

In December 2016, Congress passed the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2017. This NDAA contained Section 879, which gave the DOD the authority to, as the NDAA noted, "acquire innovative commercial items, technologies, and services through a competitive selection of proposals resulting from a general solicitation and the peer review of such proposals" (NDAA, 2016). This general solicitation, known as a Commercial Solutions Opening (CSO), was modeled after broad agency announcements (BAAs). For context, federal agencies use BAAs, as the Federal Acquisition Regulation (FAR) states, "to fulfill their requirements for scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding rather than focusing on a specific system or hardware solution" (Federal Acquisition Regulation [FAR] 35.016, 2022) whenever they can reasonably anticipate the receipt of "meaningful proposals with varying technical/scientific approaches" (FAR 35.016, 2022). However, contracting officers (COs) can only use BAAs for *basic and applied research requirements*. In contrast, and as identified by the Defense Acquisition University (DAU), COs can implement CSOs "to acquire innovative *commercial* items, technologies, or services that directly meet program requirements" (Defense Acquisition University [DAU], 2022).

Even though Congress authorized the use of CSOs at the end of 2016, the OUSD(A&S), Defense Pricing and Contracting (DPC) did not implement the CSO Pilot Program until June 2018 (Holt, 2018; Tenaglia, 2022). Congress originally authorized the CSO Pilot Program until 30 September 2022 (NDAA, 2016). However, this program proved to be so valuable that Congress extended the program through 30 September 2025 in the NDAA for FY2021 (NDAA, 2020). Then, in the FY2022 NDAA, Congress

permanently reauthorized the CSO program (NDAA, 2021), which gave the DOD what it called "permanent CSO authority" (DAU, 2021; Tenaglia, 2022).

Congress designed the CSO program to give the DOD more access to innovative products and services from nontraditional defense contractors (Holt, 2018; Air Force Contracting, 2020) by removing some of the common barriers these companies face when entering the B2G market. There are a few ways in which the CSO program helps the DOD reduce the barriers to entry for the B2G market. For example, the DOD's Source Selection Procedures do not apply under the CSO program (Holt, 2018). This exclusion benefits industry partners, because the DOD's Source Selection Procedures do not reflect standard commercial practices. By removing these government-specific procedures, the DOD is lowering the barrier to entry for its commercial counterparts. Table 4 displays some of the ways that the CSO program's lowers the barrier to entry, as identified in this section, and it also introduces other benefits of the CSO program.

Table 4.   11 Benefits of the CSO Program. Adapted from Holt (2018).

1. CSOs are considered competitive procedures for the purposes of section 2376(1) of Title 10 of the United States Code and Far 6.102.
2. DoD Source Selection Procedures do not apply.
3. Solicitations may address multiple areas of interest (general or more specific) and can be issued for longer periods (i.e., a 3-year solicitation may be issued as long as it is updated annually).
4. Evaluations are streamlined with the primary evaluation factors already provided for in the Class Deviation and are conducted via a technical evaluation ("peer review").
5. All supplies or services procured via a CSO are treated as commercial items absent the requirement for a commercial item determination.
6. The program allows for the award of a contract or an Other Transaction for Research or Prototype as long as the solicitation indicates the Government reserves the right to award a contract or agreement as a result of this solicitation. (Note: Prototypes may also be procured via the commercial contract.
7. A separate synopses in accordance with FAR 5.201 is NOT required.
8. The solicitation must address the timelines for proposal submittal in accordance with FAR 5.203(b) and the allowance for a 45-day response time at FAR 5.203(e) is only required if a CSO is used for R&D with contract awards over the SAT.
9. CSOs may be structured to allow for the receipt of proposals at any time during its opening.
10. Funding type is not limited to 3600 funds (except for R&D, but R&D is not limited to budget activities 6.1-6.4).
11. Significant decrease in acquisition cycle time.

The CSO program also streamlines the procedures for contracting personnel. For example, if the items, services, and technologies purchased through a CSO meet the NDAA's definition of "innovation," then COs are not required to complete a Commercial Item Determination for their contract files. Instead, all products and services resulting from a CSO are otherwise considered to be commercial (Snyder, 2018; Air Force Contracting, 2020). The most important takeaway is that, by leveraging the CSO program, the DOD can

expedite the delivery of innovative commercial capabilities to the warfighter while also making the acquisition process more agile (Snyder, 2018).

The DAF's use of CSOs exploded between 2019 and 2021, as pitch days became more prevalent. In fact, the DAF hosted its first pitch day on 6 March 2019 in New York (AFVentures, n.d.-b). For this first pitch day, COs used BAAs and CSOs to solicit innovative ideas (Air Force Contracting, 2019), and they used their government purchase cards to quickly award contracts to small businesses. On average, these new contractors received payment in 15 minutes (AFVentures, n.d.-b). The DAF's senior contracting leaders considered this event to be a success, and they used this model to establish a new pathway for encouraging innovative and non-traditional small businesses to contract with the DAF (Air Force Contracting, 2019). Consequently, the DAF leveraged the CSO program and obligated funds at an exponential rate, as shown in Figure 2 (DOD, 2021).

Fiscal Year	Total DoD CSO Actions
2019	17
DLA	2
AF	15
2020	45
DLA	4
DHA	1
AF	34
Army	6
2021 Qtrs 1-2	48
DHA	6
AF	35
Army	7
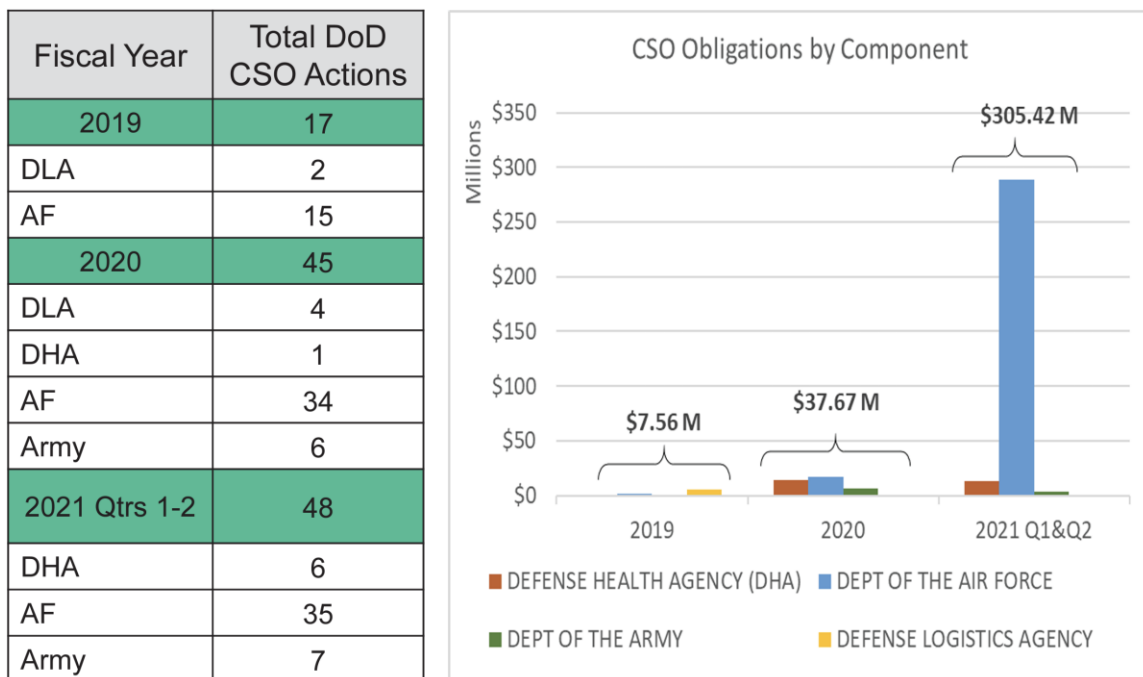
Figure 2.   CSO Utilization from 2019 to 2021. Source: Department of Defense (2021).

D. AFWERX AND THE AIR FORCE'S INNOVATION ECOSYSTEM

> Explore what an Industry Storefront and Innovation Organization could look like for the Air Force, similar to what USSOCOM had accomplished with their SOFWERX Innovation Hub.
>
> —Vice Chief of Staff of the Air Force (VCSAF) in February 2017
> (AFWERX, 2021, p. 9)

AFWERX's time as a startup entity began on 5 July 2017 when its stakeholders and volunteer representatives, otherwise known as the *coalition of the willing*, first solidified its aggregation and unification efforts under the VCSAF's direction (AFWERX, 2021; Maue, 2021). Subsequently, on 21 July 2017, then-Secretary of the Air Force Heather Wilson officially announced the creation of AFWERX during her visit to Nellis Air Force Base in Las Vegas, Nevada (Air Force Public Affairs [AFPA], 2017a). Modelled after the Special Operations Command's SOFWERX, Airmen from organizations such as the U.S. Air Force Warfare Center (USAFWC) and Air Force Research Laboratory (AFRL) created AFWERX to promote easier connections between the Air Force and the non-traditional small businesses who wielded the potential to provide new capabilities to the warfighter more quickly and at a lower cost than the DOD's more traditional acquisition methods (AFPA, 2017a; Aerotech News, 2017; AFWERX, 2021). Thus, AFWERX's mission was and continues to be to connect innovators and accelerate results (AFWERX, 2020; Maue, 2021).

The concept for AFWERX originated in part because the USAFWC observed that many potential innovators around Nellis Air Force Base did not know how to formally present their ideas to the DOD, since the DOD held the reputation of being unapproachable and mired in bureaucracy (Aerotech News, 2017). To help overcome this perception, the USAFWC envisioned AFWERX locations engaging directly with small businesses to lower the barrier to entry and eventually expand across the U.S. to "serve as the central nodes for Air Force innovation engagements" (Aerotech News, 2017). After Secretary Wilson's announcement, AFWERX lowered the barrier to entry and expanded the Air

Force's innovation ecosystem by establishing innovation hubs at Crystal City, Virginia, Las Vegas, Nevada, and Austin, Texas (AFWERX, 2021; Maue, 2021).

AFWERX-DC became AFWERX's first innovation hub in September 2017. This innovation hub offered a collaboration space to connect Air Force and Pentagon personnel with academia and industry participants (AFWERX, 2021). AFWERX-DC also conducted data analysis and created market research reports to improve the organization's decision-making processes. To realize this second purpose, AFWERX-DC leveraged a Partnership Intermediary Agreement with the Virginia Tech Applied Research Corporation. This location also generated scouting reports to help AFWERX Airmen locate and connect with many different technology experts (AFWERX, 2021).

After establishing AFWERX-DC, AFWERX announced its intention to launch a dual-purpose technology accelerator program (AFPA, 2017b). This program focused on improving relationships with non-traditional small businesses that created dual-purpose technologies, or technologies with a private and public sector application. AFWERX's technology accelerator program focused on businesses that could develop various autonomous technologies in support of the warfighter (AFPA, 2017b). This accelerator program began in January 2018 and ended three years later when AFWERX shifted its focus towards building and growing AFVentures, which became the DAF's commercial investment group (AFVentures, 2021; Martin, 2017; Maue, 2021).

With support from the Vice President, the Secretary of the Air Force, and the Chief of Staff of the Air Force, AFWERX-Vegas opened in January 2018 and became AFWERX's second functioning innovation hub (AFWERX, 2021). AFWERX-Vegas served many purposes. For example, it became the gateway for introducing industry and government personnel to the AFWERX mission. Like AFWERX-DC, AFWERX-Vegas created a collaboration space to connect Air Force personnel with academia and industry partners. AFWERX-Vegas also facilitated workshops, sprints, and other prototyping initiatives. Overall, this location received a lot of attention thanks to its proximity to two Air Force bases, an international airport, luxurious hotels, and many local attractions (AFWERX, 2021).

Finally, on 28 June 2018, Secretary Wilson attended the opening of AFWERX-Austin within Austin's Capital Factory, which became AFWERX's third innovation hub (Hudson, 2018). Unlike the two other innovation hubs, Air Force Reservists led AFWERX-Austin and supported the Pilot Training Next initiative. Despite these differences from AFWERX-DC and AFWERX-Vegas, Airmen working at AFWERX-Austin also supported the SBIR and STTR programs, hosted workshops, and connected Airmen with other innovators and researchers (AFWERX, 2021).

E.   THE VALLEY OF DEATH

For this study, the *Valley of Death* refers to the point in the B2G exchange where innovative technologies and solutions vanish between Phase II and Phase III of the SBIR program, as shown in Figure 3. Since the SBIR program does not fund Phase III solutions, some interested parties may argue that certain innovative solutions fail because of the government's inability to connect the Phase II solution with relevant operational units. Even if an operational unit becomes aware of the innovative solution, the unit may lack the funding needed to implement the solution. Despite this definition and context, RAPIDx is actively working to change the contracting culture and help innovative solutions gain more traction by pushing this *Valley of Death* past Phase III, rather than before Phase III, as shown in Figure 4 (Eiserman & Dorn, 2022).

The key takeaways are that there are many innovative solutions that the DAF funds during the early SBIR and STTR phases. Without DAF funding, many prospective small businesses are not incentivized to enter the B2G marketplace. The small businesses who do enter the B2G marketplace still require some financial incentives and reassurance that their solution can reach the commercialization phase for the venture to be worthwhile. Whether right or wrong, some of these solutions see their progress stop after Phase II or Phase III, which forces them to disappear into the *Valley of Death*.
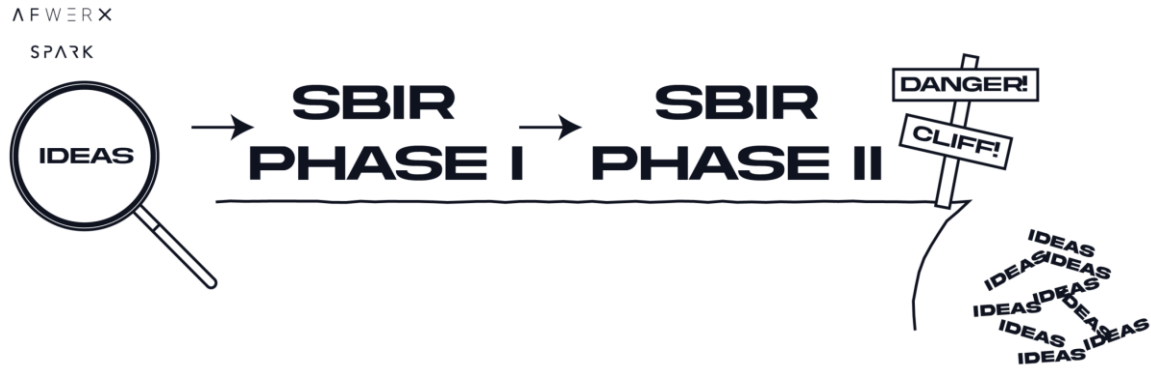
Figure 3.   The *Valley of Death*. Source: Eiserman and Dorn (2022).
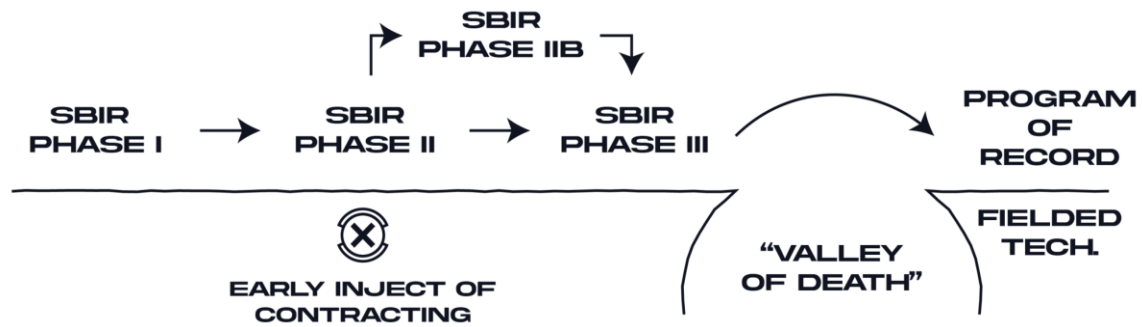
Figure 4.   The *Valley of Death* Transition Model. Source: Eiserman and Dorn (2022).

F.   UNDERSTANDING AFVENTURES' SUPPLEMENTAL FUNDING PILOT PROGRAM, ALSO KNOWN AS THE STRATFI/TACFI PROGRAM

The AFRL SBIR Center of Excellence initiated the Supplemental Funding Pilot Program (SFPP) in FY2020 to bridge the *Valley of Death* that exists between the second and third phases of the SBIR and STTR program, as shown in Figure 5. In its first year, the AFRL SBIR Center of Excellence emphasized the central execution of strategic funding increases (STRATFIs) or *big bets*. Then in FY2021, AFWERX became realigned under AFRL as AFRL/RG. Here, the SFPP transitioned to a decentralized execution approach to encourage more opportunities to potentially plan for SBIR Phase III awards and also execute tactical funding increases (TACFIs) (Eiserman & Piller, 2021).
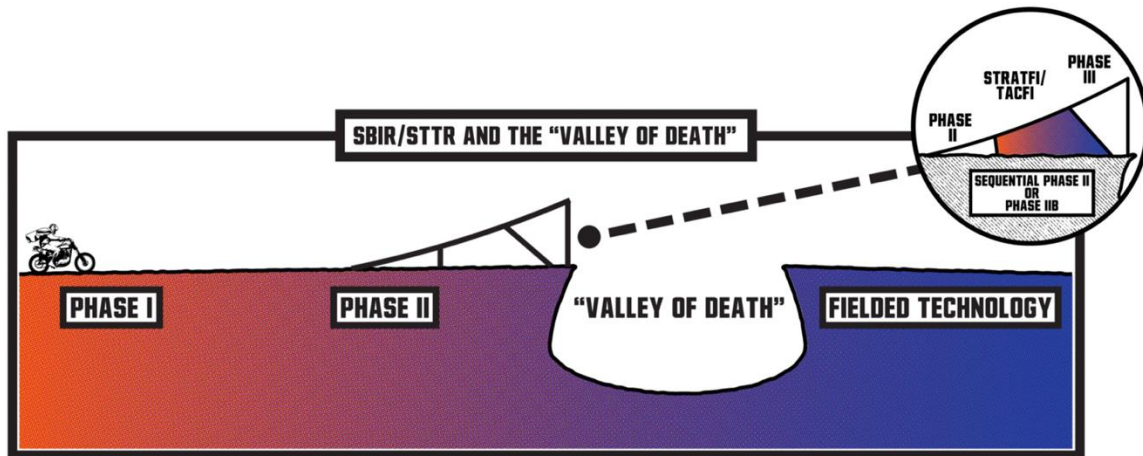
Figure 5.   SFPP Visualization. Source: Eiserman and Piller (2021).

In FY2022, AFWERX began its management of the DAF SBIR and STTR programs through its AFVentures Division, where it made iterative changes and provided three ways for innovative small businesses to interact with the DAF: Open Topic, Specific Topic, and the SFPP—now named the STRATFI/TACFI program (AFWERX, 2022a). The placement of these three programs within AFVentures can be seen in Figure 6. In particular, the STRATFI/TACFI program focuses on offering contractors Phase IIB awards, which are either contract modifications that extend Phase II awards or a new award if the foundational Phase II award expired, so long as a third party matches the SBIR/STTR funds. This extension gives contractors who reached Phase II more money and time to conduct research and further scale its efforts while the Government, customer, or end-user work to secure funds in support of a Phase III award (Eiserman & Piller, 2021). Contractors can receive TACFI awards that range from $375 thousand to $1.8 million, whereas STRATFI awards range from $3 million to $15 million (AFVentures, 2022). However, the total contract value of these awards can exceed those stated values. For example, the total contract value for dual-use STRATFI awards can range up to $30 million (C. Eiserman, personal communication, 28 October 2022). The funding distinction between the upper limit of TACFI awards, $1.8 million, and the lower limit of STRATFI awards, $3 million, resulted from an AFVentures decision to financially distinguish tactical and strategic efforts (C. Eiserman, personal communication, 20 October 2022). However, we find that

$1.2 million gap, itself, has no known explanation. The general overview of this program can be seen in Figure 7.

AFVentures - HOW THE PROGRAM WORKS

AFVentures - How the program works

1 PHASE I
Feasibility Study
Open & Specific Topics

OPEN TOPIC
- Up to $75K per award
- 3 month period of performance
- ~700 awards per year
- "Open door for innovation"

SPECIFIC TOPIC
- Up to $150K per award
- 9 month period of performance
- ~300 awards per year
- Built in Air Force Customer
- Includes Pitch Day opportunities

2 PHASE II
Prototype
Open, Specific & Direct to Phase II (D2P2) Topics

OPEN TOPIC
- Up to $1.25M per initial award
- Up to 21 month period of performance
- ~300 awards per year
- Customer Memorandum required
- Matched funding encouraged
- D2P2 opportunity if customer is already known and Customer Memorandum is signed

SPECIFIC TOPIC
- Up to $1.25M per initial award ($1.7M for STTR)
- Up to 27 month period of performance
- ~200 awards per year
- Built in Air Force Customer
- Includes Pitch Day opportunities
- D2P2 opportunities

3 STRATFI/TACFI
Strategic Funding Increase (STRATFI) and Tactical Funding Increase (TACFI) Program

- Notice of Opportunity
- TACFI - $375K - 1.8M SBIR/STTR funds
- STRATFI - $3M - $15M SBIR/STTR funds
- ~100 TACFI and ~15 STRATFI awards per year
- Defense only or dual use matching options
- Private Investor Opportunities

4 PHASE III
Transition

- Continuation, derivation, or extension of SBIR/STTR Phase I, II or STRATFI/TACFI work
- Contract with partnering US Government customer
- Utilizes non-SBIR funds

Figure 6.   AFVentures Program Structure. Source: AFWERX (2022a).

Simply put, AFVentures releases a notice of opportunity (NOO) each year, which is similar to a Request for Information, to inform interested and eligible companies with a Phase II solution that they can submit a capability package (Eiserman & Piller, 2021). This NOO remains open for half a year, traditionally between January and June, and AFVentures reviews these packages on a first come, first serve basis (Eiserman & Piller, 2021). To respond to any NOO, businesses must first meet the seven requirements shown in Figure 7 (AFWERX, 2022b).
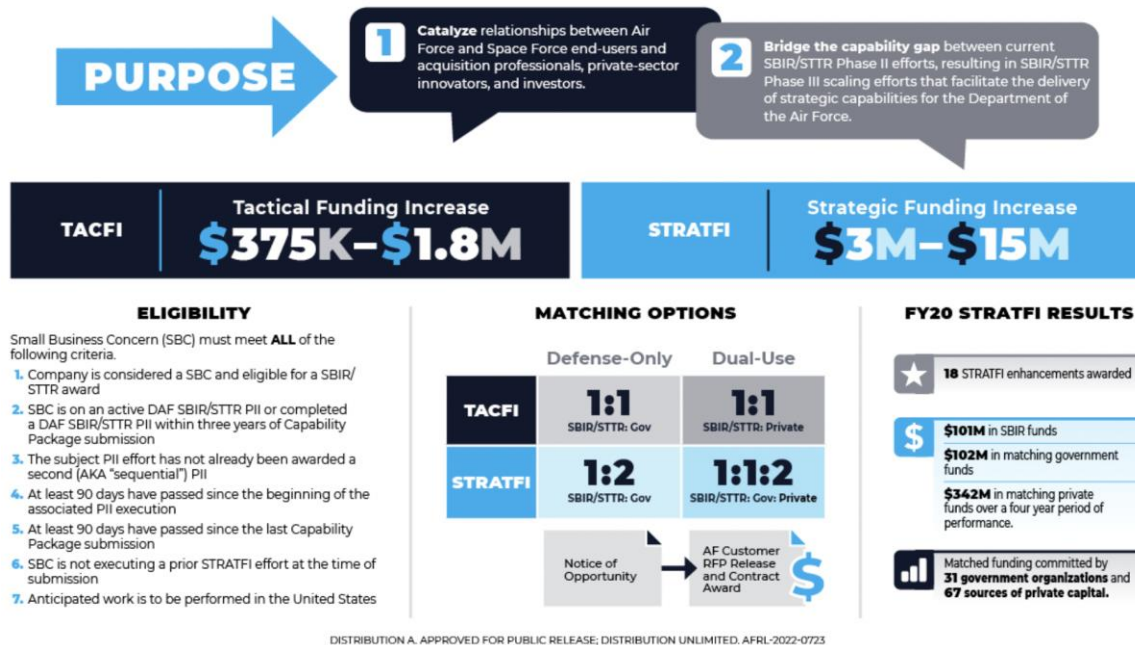
Figure 7.   STRATFI/TACFI Overview. Source: AFVentures (2022).

G.   WHERE RAPIDX FITS WITHIN THIS INNOVATION ECOSYSTEM

Originally, in 2017, Airmen at AFWERX-Austin attempted to award prototype contracts without any warranted contracting support (C. Eiserman, personal communication, May 6, 2022). This situation arose, in part, because AFWERX-Austin did not consist of any contracting professionals. This situation also occurred, because the Airmen at AFWERX focused on quickly executing innovative solutions and misunderstood the requirement that only warranted personnel can sign contracts. Therefore, to keep AFWERX-Austin from failing in its efforts to identify and acquire innovative technology solutions, RAPIDx formed out of necessity in July 2018 to provide AFWERX-Austin and the Air Education and Training Command (AETC) Technology Innovation Division (ATID) at Randolph Air Force Base, Texas, with legitimate contracting authority (C. Eiserman, personal communication, May 6, 2022).

We refer to this initial version of RAPIDx as RAPiDx, since the lowercase *i* appeared in the organization's original patch as seen in Figure 8 (Eiserman & Dorn, 2022). RAPiDx began as an innovative contracting cell that consisted of Airmen assigned to both

the 338th Specialized Contracting Squadron at Randolph Air Force Base, Texas, and the 82nd Contracting Squadron at Sheppard Air Force Base, Texas. Together, volunteer Airmen from these two units provided ad hoc contract support for many innovative programs, to include Pilot Training Next, Maintenance Net, and Project NEXUS (AFWERX/PK, 2020).

Figure 8.   RAPiDx Patch. Source: Eiserman and Dorn (2022).

Then in November 2019, SAF/AQC redesignated RAPiDx into a contracting directorate that reported to SAF/AQC and provided direct support for AFWERX and AFVentures (AFWERX/PK, 202). By this point, RAPiDx consisted of a couple full-time Air Force reservists who awarded contracts for AFWERX-Austin until their active orders expired. The leanness was intentional and modelled after AFWERX and AFVentures' internal organizational structure. Yet, RAPiDx's first standard operating procedure reveals that the office originally wanted to be a full-fledged organization and requested 11 full-time equivalent (FTE) positions (AFWERX/PK, 2020). RAPiDx never received 11 FTEs, but it did receive a temporary influx of volunteers in April 2020 in response to the COVID-19 pandemic. During the pandemic, RAPiDx functioned as a geographically separated network of contracting professionals who supported the Air Force's Acquisition COVID-19 Task Force and provided agile contract support for relief, resilience, and recovery efforts

across the United States (Manresa, 2020). RAPiDx stayed busy coordinating this vital contracting support over the next few months and leveraging CSOs as a blanket method for addressing COVID-driven requirements and soliciting Phase I solutions (A. Riffle, personal communication, October 25, 2022). However, after exhausting their allotted hours, the reservists who ran RAPiDx full-time in Austin left the organization, causing RAPiDx to temporarily stall in September 2020 (AFWERX/PK, 2020; C. Eiserman, personal communication, May 6, 2022).

RAPiDx recovered shortly thereafter in the Fall of 2020 when two active duty servicemembers moved to Austin to support RAPiDx full-time and a third member joined to provide full-time virtual support from Wright-Patterson Air Force Base (Eiserman & Dorn, 2022). These new members created the second and current version of RAPiDx, which we refer to as RAPIDx, since the uppercase *I* appears in the organization's current patch as seen in Figure 9. This new team of innovators gave RAPIDx a new trajectory.

Figure 9.   RAPIDx patch. Source: Eiserman and Dorn (2022).

Instead of becoming an executing organization, this new core tried to help RAPIDx become a concept of operations (CONOP), versus a more traditional organization, by seeking out support from the Air Force's senior contracting leaders to ensure that there was

at least one liaison officer (LNO) identified at each of the senior contracting official's (SCO's) offices (C. Eiserman, personal communication, May 6, 2022). Here, these LNOs would coordinate information from the end-user, who either needed a novel solution or recently implemented a novel technology, and then push that information to their SCO. The SCO would then conduct a capability analysis within their portfolio of squadrons to see if any other squadrons had the in-house capability to execute a contract for the novel solution (C. Eiserman, personal communication, May 6, 2022).

RAPIDx ultimately received approval to stand up its formal LNO network in December 2020. After receiving this approval, RAPIDx's core team members spent the next year expanding the LNO network under SAF/AQC's Contracting Operations Division (SAF/AQCK), as shown in Figure 10 (Eiserman & Dorn, 2022). They also coordinated support for various entities, to include AFWERX, other Air Force contracting units, and non-traditional small businesses (C. Eiserman, personal communication, May 6, 2022).

Then in October 2021, RAPIDx became realigned as an official branch under SAF/AQC's Innovation Division (SAF/AQCR) (Eiserman & Dorn, 2022). RAPIDx's position under this organizational structure can be seen in Figure 11. While working under SAF/AQCR, RAPIDx helped franchise innovation to all SCOs in an effort to leverage Air Force contracting resources through a command-and-control network (Holt, 2021). However, SAF/AQCR dissolved in August 2022 and RAPIDx realigned under the Policy Division (SAF/AQCP), as shown in Figure 12.
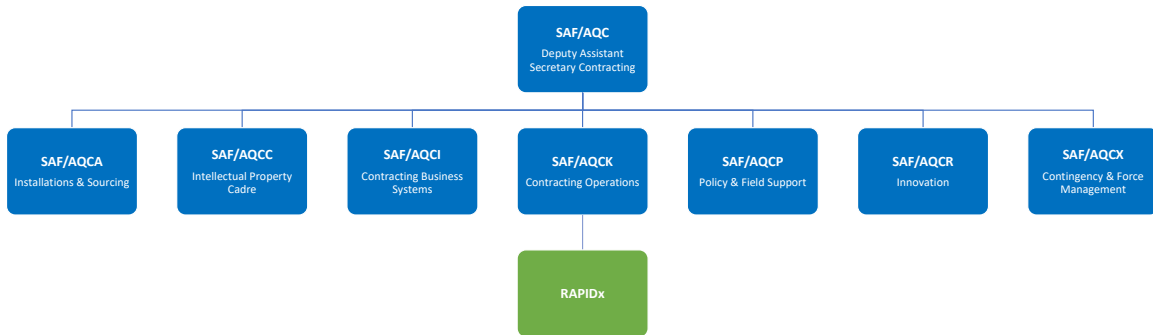
Figure 10.   RAPIDx Organizational Structure from December 2020 to October 2021. Adapted from M. Carmody, personal communication (2022).
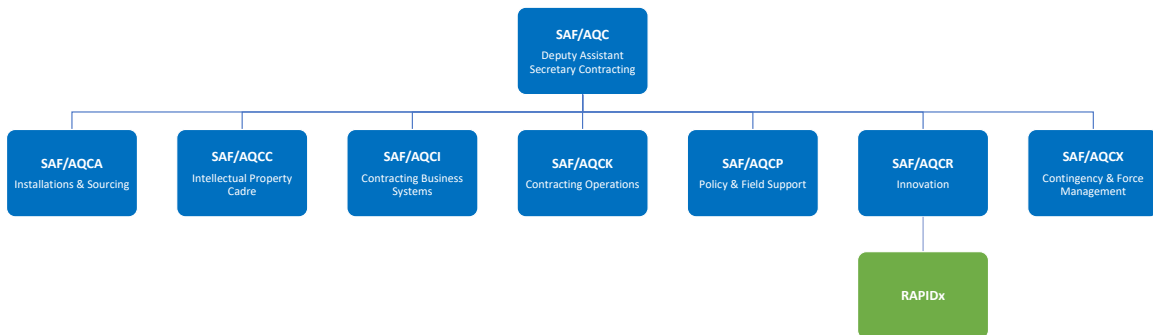
Figure 11.   RAPIDx Organizational Structure from October 2021 to August 2022. Adapted from M. Carmody, personal communication (2022).
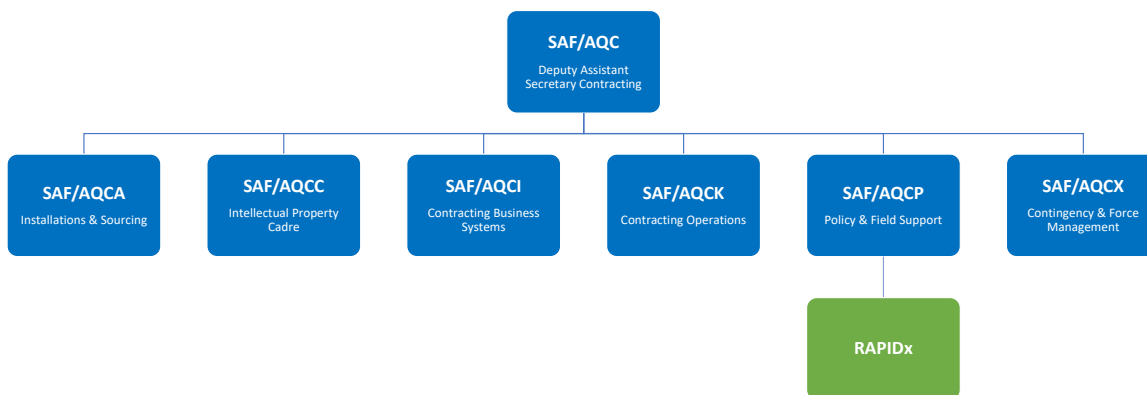
Figure 12. RAPIDx Organizational Structure since August 2022. Adapted
from M. Carmody, personal communication (2022).

Presently, RAPIDx's main goal for the LNO network is to provide the Air Force's contracting community with the means to democratize innovation by communicating up, down, and across contracting units to identify and share the innovative ideas and solutions that the DAF contracts for (Eiserman & Dorn, 2022). To accomplish this goal, the LNOs pursue and implement RAPIDx's nine core initiatives to improve the communication culture across the whole of Air Force Contracting (see Table 5). There are currently two LNOs assigned at each SCO office.

Additionally, according to RAPIDx's internal LNO directory that is located on its SharePoint website, there are also 130 individuals who serve in the LNO network beyond the scope of the SCO-level offices. Roughly 60% of those in this more generalized LNO network are Air Force civilians (see Figure 13), and almost 38% of the general LNOs joined the RAPIDx network in 2022 (see Figure 14). Moreover, just around 36% of general LNOs work under the Air Force Materiel Command (see Figure 15), which easily the most represented MAJCOM. Additionally, roughly 50% of the general LNOs provide operational contract support (see Figure 16). Altogether, RAPIDx's comprehensive LNO

network consists of approximately 154 Air Force contracting professionals worldwide who communicate what they are doing and how with each other. Thus, RAPIDx is steadily building its network of contracting professionals who can share their successes, failures, and other innovation-related ideas.

Table 5.   How to Shift the Contracting Culture. Adapted from Eiserman and Dorn (2022).

1. Break away from the formalized, traditional, and antiquated DOD-contractor relationships.
2. Build partnerships and relationships with non-traditional companies and emergent technology markets.
3. Democratize information.
4. Develop the ability to pivot at the speed of relevance through purposeful early engagement.
5. Grow a new industrial base around the current one.
6. Increase transparency.
7. Leverage dual-use technologies.
8. Operationalize innovation.
9. Reduce barriers to entry.
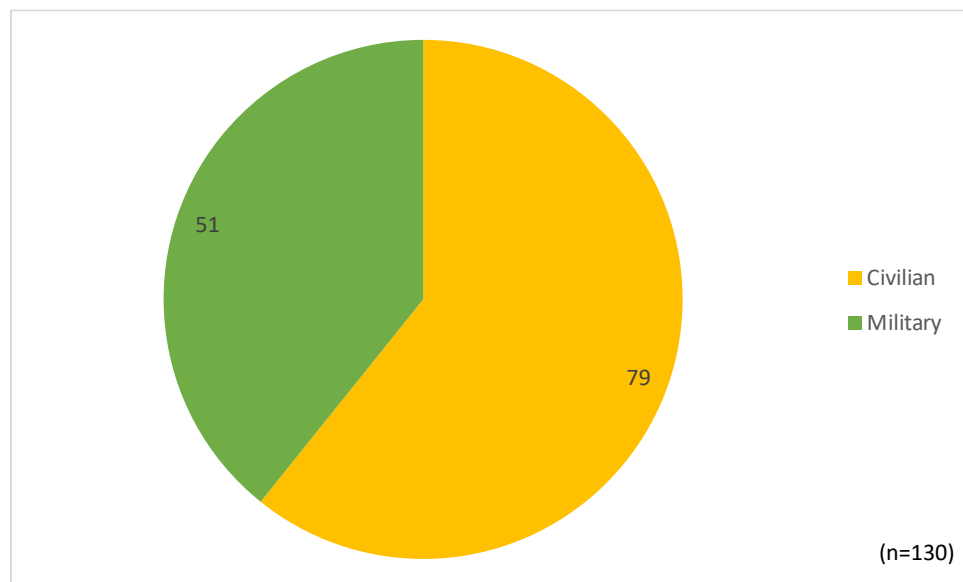
Figure 13.   General LNO Network Distribution by Personnel Type
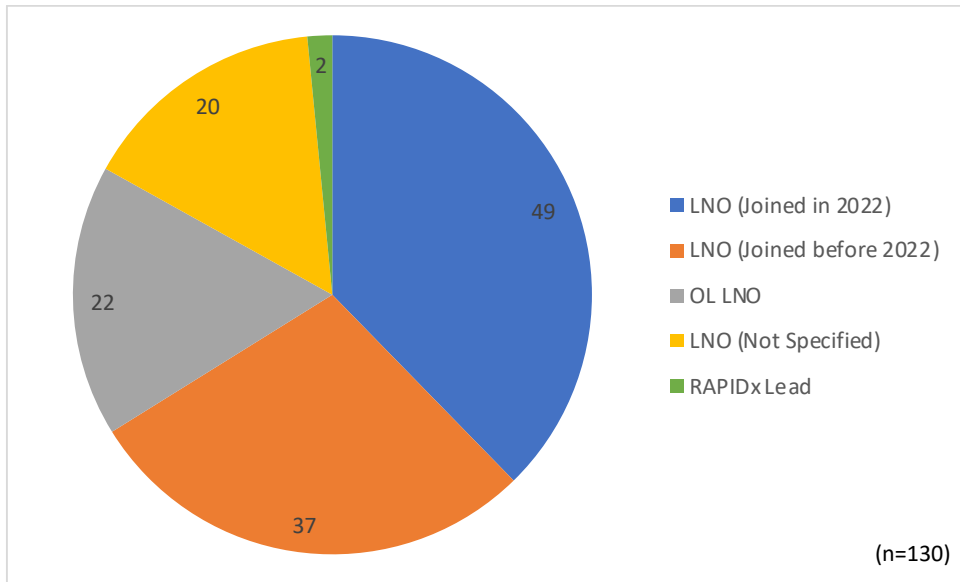
Figure 14.   General LNO Network Distribution by Role and Timeframe Joined
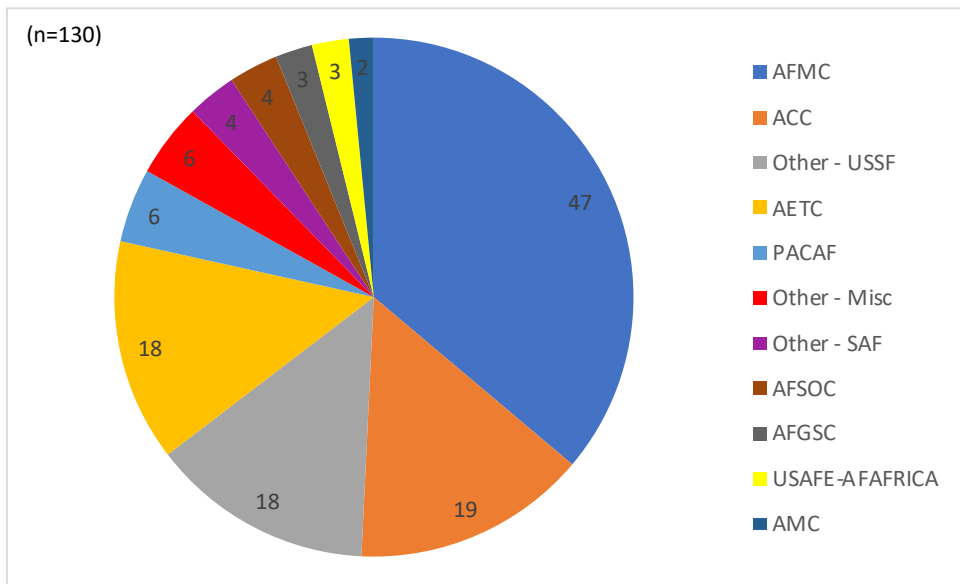
Figure 15.   General LNO Network Distribution by MAJCOM
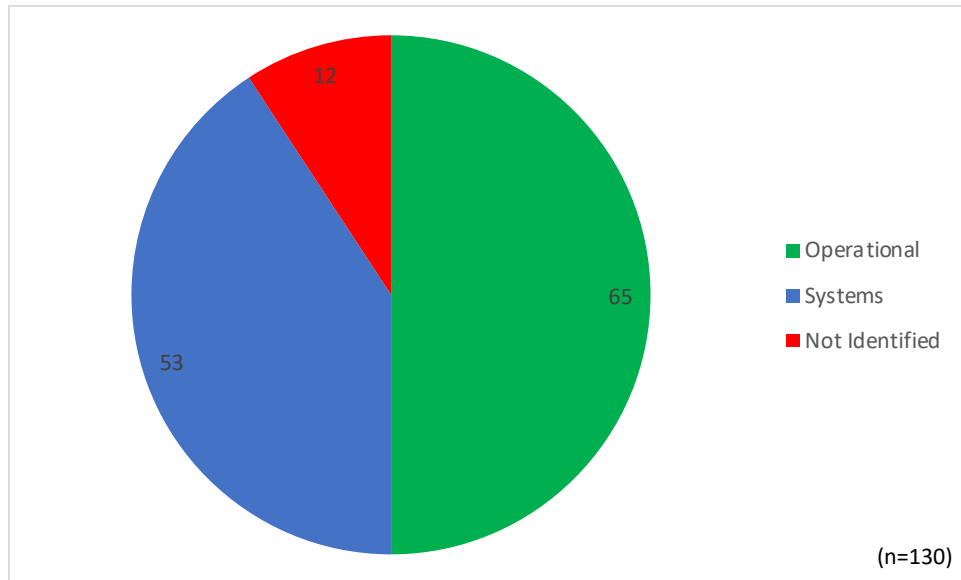
Figure 16.   General LNO Network Distribution by Contracting Area

H.   SUMMARY

In this chapter, we introduced the SBIR and STTR programs and explained their three general phases. Then we briefly examined the current state of the aerospace DIB and introduced the CSO program. We also discussed the background and significance of AFWERX, the *Valley of Death*, and AFVentures' STRATFI/TACFI program. Then we concluded this chapter by explaining how RAPIDx is related to these innovative topics, and we provided some figures to help visualize the diversity of RAPIDx's LNO network. The next chapter contains our literature review, which addresses the attributes of effective public procurement organizations, the GAO *Framework*, and other NPS theses that applied the GAO *Framework* to an acquisition function.

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III. LITERATURE REVIEW

I. INTRODUCTION

In this chapter, we examine various academic sources pertaining to the theories and attributes of effective PPOs, which furthered our understanding of RAPIDx. This literature review begins by distinguishing B2G relationships from business-to-business (B2B) relationships. This literature review also reveals that effective PPOs are accountable, transparent, and meet agency requirements by optimizing risk and VFM outcomes (Gore, 1993). This literature review also explores the GAO 21–492 case, which identifies the industry best practices that PPOs should adopt. Afterwards, we address the topic of network theory and relate it to the second and third cornerstones of the GAO *Framework*. We conclude this chapter by reviewing the application and adaptation of the GAO *Framework* in the previous MBA theses completed at NPS.

J. ATTRIBUTES OF EFFECTIVE PPOS

To better understand the attributes of effective PPOs, we first researched what characteristics or factors distinguished PPOs from private procurement organizations. This effort prompted us to consider the differences between the B2G and B2B relationships. One source really shaped our understanding of these distinctions. In their article, "Uncle Sam Rising: Performance Implications of Business-to-Business Government Relationships," Josephson et al. (2019) identified three major qualities that distinguished the B2G marketplace from the B2B marketplace.

The first major quality that distinguishes B2G exchanges from B2B exchanges is identified as *procurement mission*, which Josephson et al. further divided into three key differences: *value proposition*, *risk preference*, and *spending pressures*. For value proposition, B2B exchanges are defined by each party's pursuit to achieve the best possible value for their respective organization. In contrast, B2G exchanges are defined by the way they combine value with socioeconomic goals. For example, PPOs must provide societal welfare through the use of small business set-asides, and these mandatory set-asides reduce PPOs' ability to maximize the value of their purchases. For risk preference, B2B exchanges

tend to be more risk tolerant, whereas B2G exchanges tend to be more risk averse. One reason for this is that the agents who work for PPOs lack the lucrative incentives that private organizations have to promote risk taking. For spending pressures, Josephson et al. observed that PPOs faced greater pressure to reduce total costs, which often resulted in PPOs awarding contracts to firms who just met the minimum requirements. In contrast, B2B suppliers related higher prices with higher quality and could afford to pay for the higher-priced solutions (Josephson et al., 2019).

The second major quality that distinguishes B2G exchanges from B2B exchanges is identified as *procurement regulations and oversight*. For this attribute, Josephson et al. noted that B2G exchanges are defined by many regulations and oversight protocols, whereas B2B exchanges are not beholden to the same level of guidelines and restrictions. Consequently, B2G relationships are more transparent, reducing the likelihood of information asymmetry, and are shaped by the high moral standards set for agents working for PPOs. In contrast, B2B relationships are less transparent, increasing the likelihood of information asymmetry, and are shaped by the flexibilities and moral ambiguities that come with private relationship-building tactics (Josephson et al., 2019).

The third major quality that distinguishes B2G exchanges from B2B exchanges is identified as *procurement scale, scope, and planning horizon*. For this attribute, Josephson et al. found that, given the total number of contracts and resulting spend, the B2B marketplace cannot replicate the B2G marketplace. Additionally, the customers in B2G exchanges tend to avoid the solvency and bankruptcy issues experienced by those in many B2B exchanges, and PPOs tend to provide more timely payments than organizations in the B2B marketplace (Josephson et al., 2019).

After distinguishing the key differences between B2G and B2B exchanges, we looked for literature addressing the attributes of effective PPOs. In "#eVALUate: Monetizing Service Acquisition Trade-offs Using the Quality-Infused Price Methodology," Finkenstadt and Hawkins (2016) stated that effective PPOs share three major objectives: *transparency*, *VFM*, and *meeting agency requirements*. They also explained that these objectives are interoperable, where the PPOs' efforts to pursue one objective also facilitates and promotes the other objectives (Finkenstadt & Hawkins, 2016).

1. Transparency

Transparency is rooted in a PPO's ability to maintain public trust. This type of trust is a byproduct of the PPO's proper expenditure of taxpayers' dollars, which PPOs use to purchase products and services. Within the public sector, transparency also refers to the availability of information, which enables external stakeholders to monitor the workings or performance of government bodies (Grimmelikhuijsen, 2012). Although the meaning of the word transparency has grown in importance over time, it used to be common practice for people to use the terms transparency and accountability interchangeably. These terms are now distinct concepts.

To better distinguish the concepts of transparency and accountability, we looked at two definitions of accountability. In their book, *Democratic Governance*, March and Olsen (1995) defined accountability as the "attribution of responsibility, blame, and praise to specific actors and institutions, and the possibility to hold them to account eventually" (Mabillard & Zumofen, 2020, p. 96). In a different article, "Transparency and Accountability—The Case of Public Procurement Practices in Switzerland," Mabillard and Zumofen (2020) defined accountability as an "obligation for public officials called to account to respond to questions formulated by various stakeholders such as the press or interest groups" (Mabillard & Zumofen, 2020, p. 100). Both definitions capture the spirit of accountability, and these definitions helped us define accountability as the public's ability to enforce the PPOs' obligation to procure the products and services that are in the public's interest.

According to many studies, the concept of transparency is entrenched in the minds of both internal and external stakeholders. Given the recent advancements to communication technologies, it is a lot easier for stakeholders to maintain and share their information and progress. Moreover, since many businesses are filled with employees who are often, if not always, connected to the internet, transparency has become a routine expectation in society (Bennis et al., 2008; Tapscott & Ticoll, 2012). Likewise, in her 2009 article, Carolyn Ball, the director of graduate programs at the University of Maine and a published researcher of organizational theory, explained that "the evolution of the use and meaning of the word transparency has much to do with supranational organizations and

nongovernmental organizations" (Ball, 2009, p. 294). Ball also highlighted the growing distinction between transparency and accountability when she observed that "presidential candidates call for greater transparency and accountability in government, when in the past, they might simply have called for greater accountability" (Ball, 2009, p. 294).

2. Value for Money

In her article, "Value for money and international development: Deconstructing myths to promote a more constructive discussion," Jackson (2012) defined VFM as "the optimum combination of whole-life cost and quality (or fitness for purpose) to meet the user's requirement" (Jackson, 2012, p. 1). In this context, PPOs seek to find the optimal balance between a solution's economy, efficiency, effectiveness, and equity. We can use all four of these dimensions to assess how well PPOs manage their resources and maximize their VFM. However, none of these dimensions can be assessed in isolation (Jackson, 2012). Moreover, in "Measuring Public Procurement Rules and Practices," Nogues Comas and Mendes do Santos (2021) noted that the VFM concept consists of multiple features. More specifically, the most common features that enabled effective PPOs to consistently achieve the best VFM included accountability, competition, efficiency, innovation, and transparency (Nogues Comas & Mendes dos Santos, 2021).

These features can also inform the FAR's definition of best value, which we relate to VFM. According to the FAR, best value is open-ended and defined as, "the expected outcome of an acquisition that, in the Government's estimation, provides the greatest overall benefit in response to the requirement" (FAR 2.101, 2022). The FAR also addresses the best value concept in FAR Part 15, in which best value appears on a continuum. On one end of the continuum, COs can determine best value using a full tradeoff process that, as the FAR states, "permits tradeoffs among cost or price and non-cost factors" (FAR 15.101-1, 2022). On the other end of the continuum, COs can find best value using the lowest price technically acceptable (LPTA) approach when, according to the FAR, "best value is expected to result from selection of the technically acceptable proposal with the lowest evaluated price" (FAR 15.101-2, 2022).

3. Meeting Agency Requirements

All PPOs must meet agency requirements on time, to include purchasing their end-users' requests for goods and services (Congressional Research Service [CRS], 2015; Gore, 1993). In most cases, PPOs can meet their customers' needs with a basic contract action, so long as the nature of the requirement is well-defined. If a commercial solution is already available, then the procurement process is significantly shortened. If a commercial solution is not available, then PPOs must reach out to and collaborate with other functions to build innovative solutions that best fit the undefined requirement in an iterative development fashion (CRS, 2015). Moreover, as near peer adversaries become more threatening, the need for altering conventional PPO methods increases.

K. LEARNING FROM INDUSTRY BEST PRACTICES

The public procurement process is a generally complex process and can be completed through many different pathways. One recent GAO report considered this complexity, explored the strengths of the private sector, and benchmarked the following practices: PPOs need to (1) link performance metrics with broader strategic goals, (2) work with those who use the products and services to develop these metrics, and (3) use outcome-oriented metrics, like timeliness and quality (GAO, 2021c).

Moreover, PPOs share relatively standardized contracting processes, whereas the processes for private business may not be as standardized. So, there are some opportunities where PPOs can learn from and adapt the industry's best practices to fit within the government's current approach to performance metrics. For instance, the GAO found in its recent report that it is essential for PPOs to have some flexibility and wherewithal to recognize when process-oriented performance metrics do not meet their standards and expectations for measuring performance (GAO, 2021c). PPOs can also learn from each other if they utilize appropriate network exchanges.

L. NETWORK THEORY

In their article, "In Search of a Network Theory of Innovations," Leydesdorff and Ahrweiler (2013) referred to *network theory* as a web of observable connections that spans

many domains, facilitates communication, and consists of relationships that can be continuously reconstructed (Leydesdorff & Ahrweiler, 2013). To better understand the concept of network theory, this section of the literature review addresses the concepts of *network* and *network management*. Altogether, these concepts will inform our application of the GAO *Framework*'s second cornerstone, *Policies and Processes*, by addressing the use of RAPIDx and its LNO network. These concepts also inform our application of the third cornerstone, *Human Capital*, by exploring how RAPIDx generates the manpower needed to staff itself and its LNO network.

In their book, *The Responsible Contract Manager*, Cohen and Eimicke (2008) discussed networks and their increasing footprint in the B2G marketplace. Specifically, they noted that the "Government is moving away from the hierarchical model that predominated during the twentieth century toward a more fluid continuum of organizations collaborating to meet the needs of the public" (Cohen & Eimicke, 2008, p. 40). The Government's increased use of networks really began in the final decade of the twentieth century. As noted in *Creating a Government that Works Better & Costs Less*, Gore (1993) laid out four strategies that ultimately encouraged the use of Government networks: streamline the budget process, streamline the procurement process, decentralize personnel policies, and eliminate regulatory overkill (Gore, 1993). Likewise, Cohen and Eimicke (2008) also explained that networks enable PPOs to be more agile, efficient, flexible, and creative than the traditional bureaucracies that typically exist in most PPOs (Cohen & Eimicke, 2008). Moreover, in "Entrepreneurship, Innovation, and Regional Growth: A Network Theory," Huggins and Thompson (2015) observed that, so long as organizations manage the proper balance of its human capital, networks are capable of promoting innovation, where entrepreneurship, innovation, and regional economic growth collide (Huggins & Thompson, 2015).

Another important concept informing network theory is network management. In their book, *The Responsible Contract Manager*, Cohen and Eimicke (2008) described the characteristics of effective network managers (Cohen & Eimicke, 2008). Effective network managers must be proficient in a lot of tasks, to include bringing people together, building relationships, documenting standard operating procedures, and integrating members from

various backgrounds into a value-added progress. Additionally, Cohen and Eimicke explained that "effective network managers will spend more time focused on activities external to the organizations that employ them" (Cohen & Eimicke, 2008, p. 57). They also addressed other characteristics of effective network managers. For example, they stated that effective network managers spend a lot of time dealing with teams of peers and superiors in other organizations. They also noted that effective network managers must be flexible, be good at developing and maintaining interorganizational relationships, be good at providing feedback, be good with handling informal communication, and balance their online interactions with in-person approaches (Cohen & Eimicke, 2008). These concepts relating to network management will help inform our understanding of RAPIDx's core, full-time members.

Furthermore, in *Networks in the Knowledge Economy*, Cross et. al. (2003) stated, "as we move further into an economy where collaboration and innovation are increasing central to organizational effectiveness, we must pay more attention to the sets of relationships that people rely on to accomplish their work" (Cross et. al., 2003, p. 209). Likewise, there are some personnel roles that exist within networks that can help catalyze an environment for innovation.

In their article, "The People Who Make Organizations Go—Or Stop," Cross and Prusak (2002) researched 50 large organizations and identified four common role-players that exist within a network and are critically involved in an organization's productivity: central connectors, boundary spanners, information brokers, and peripheral specialists. Each of these roles exist in RAPIDx's LNO network, and an explanation of these personnel roles can be seen in Table 6. Cross and Prusak (2002) also explained that these four roles wielded significant influence within an organization, even though they were often invisible to senior managers (Cross & Prusak, 2002).

Table 6.   Four Critical Roles in a Network. Adapted from Cross et al. (2002).

1. <u>Central Connectors</u> - link most people in an informal network with one another. They are not usually the formal leaders within a unit or department, but they know who can provide critical information or expertise that the entire network draws on to get work done.
2. <u>Boundary Spanners</u> - connect an informal network with other parts of the company or with similar networks in other organizations. They take the time to consult with and advise individuals from many different departments regardless of their own affiliations.
3. <u>Information Brokers</u> - keep the different subgroups in an informal network together. If they did not communicate across the subgroups, the network as a whole would splinter into smaller, less-effective segments.
4. <u>Peripheral Specialists</u> - anyone in an informal network with specialized expertise.

M.   FRAMEWORK FOR ASSESSING PPOS

1.   GAO (2005) Framework

In January 2005, the GAO added interagency contracting to its high-risk list, stating, "which identifies areas in the federal government with greater vulnerability to fraud, waste, abuse, and mismanagement" (GAO, 2005, p. i). The GAO subsequently released the GAO *Framework* to help senior agency executives and accountability organizations identify an acquisition organization's strengths and weaknesses. Overall, the GAO *Framework* contains four interconnected cornerstones, which are (1) *Organizational Alignment and Leadership*, (2) *Policies and Processes*, (3) *Human Capital*, and (4) *Knowledge and Information Management*. Each cornerstone contains multiple elements for effective stewardship. Additionally, each element contains a list of critical success factors that will improve the probability that the acquisition organization will achieve its desired acquisition outcomes (GAO, 2005). A general overview of the GAO *Framework* is provided in Appendix A.

2. Previous MBA Professional Reports at NPS

Over the past 11 years, there are three instances in which NPS graduate students applied the GAO *Framework* to an organization for their MBA professional report. Finkenstadt and Peterson (2011) first used the GAO *Framework* to conduct a benchmark study of the Air Force Program Executive Office for Combat and Mission Support (AFPEO/CM). In this report, they applied the GAO *Framework*'s second cornerstone, *Policies and Processes*, to generate their list of 22 interview questions. Finkenstadt and Peterson met with 11 individuals, analyzed their policies and procedures, and transformed their resulting data into tables of the AFPEO/CM's best practices. Finkenstadt and Peterson also created a list of lessons learned and five recommendations, to be reviewed by the AFPEO/CM (Finkenstadt & Peterson, 2011).

In addition to a detailed spend analysis, Wright, Dacanay, and Guzman (2020) performed a gap analysis by applying all four cornerstones of the GAO *Framework* to the U.S. Special Operations Command (SOCOM). In all, Wright, Dacanay, and Guzman interviewed six individuals to augment their spend analysis. They transformed their resulting data into two future states for SOCOM's category management function and created a new framework, adapted from the GAO *Framework*, to assess category management functions (Wright et al., 2020).

In the most recent application of the GAO *Framework* for an MBA professional report, Mickley, Swank, and Hagen (2021) used the adapted GAO *Framework* for category management (Wright et al., 2020) to evaluate the state of acquisition for additive manufacturing in the Air Force. For this report, they applied the first, second, and fourth cornerstones of the adapted framework to generate their list of eight interview questions and inform their spend analysis. In all, Mickley, Swank, and Hagen interviewed 14 individuals. They also turned their resulting data into tables that identified positive areas, areas of concern, and best practices for the Air Force's general acquisition of additive manufacturing solutions, as categorized by each cornerstone (Mickley et al., 2021).

N. SUMMARY

In this chapter, we completed our literature review by examining sources that distinguished B2G exchanges from B2B exchanges and addressing the attributes of effective PPOs, with a focus on the objectives of *transparency*, *VFM*, and *meeting agency requirements*. Then we explored GAO 21–492, which identified some best practices leveraged by private procurement organizations. We also reviewed research that addressed the topics of *network theory*, *networks*, and *network management*, and then we briefly demonstrated how these topics apply to both the second and third cornerstones of the GAO *Framework*. Finally, we considered the application and adaptation of the GAO *Framework* in previous MBA professional reports at NPS. The next chapter contains our methodology, which captures the way we leveraged the GAO *Framework's* cornerstones and elements to develop our interview questions. The upcoming chapter also reveals how we identified interviewees, conducted interviews, and collected our data.

IV. METHODOLOGY

A. INTRODUCTION

This chapter captures the methodology used within our study. To evaluate RAPIDx, we collected data by conducting structured interviews informed by Cornerstone 2, *Policies and Processes*, and Cornerstone 3, *Human Capital*, of the GAO *Framework*. Then we interviewed members supporting RAPIDx to see how well the organization satisfies these cornerstones. We chose the GAO *Framework* as our primary reference, because it continues to be a credible and respected source that government personnel use to assess and benchmark acquisition organizations against contemporary standards. The GAO *Framework* does not assess specific contract actions, nor does it replace other existing standards and regulations. Instead, its primary purpose is to offer government executives with a standardized method to evaluate an acquisition function's strengths and weaknesses (GAO, 2005). In the end, we compiled a list of 30 interview questions (see Appendix B) to ask the Airmen and civilians supporting RAPIDx and its general LNO network about concepts relating to the GAO *Framework*'s second and third cornerstones.

B. DATA COLLECTION PROCESS

We leveraged Microsoft Teams and voice calls to complete nine oral interviews with the RAPIDx office's core members and the responsive LNOs. The interviews ranged between 30 minutes and one-and-a-half hours. We also completed four abbreviated interviews with contracting professionals who were one or more levels removed from the LNO network. For each interview, one student ran the interview while the other student captured the answers, and when necessary, interjected with clarifying questions.

More specifically, after receiving our initial RAPIDx brief in the Spring of 2022, we contacted RAPIDx's three core members and scheduled interviews with each of them. Afterwards, we attended RAPIDx's two monthly LNO meetings on Tuesday, 30 August, to ask the 36 LNOs that attended these meetings to participate in this study. We also received a comprehensive list of RAPIDx's LNOs and an additional email that identified

RAPIDx's most active LNOs to link us to our interviewees. At the end of each interview, our interviewees recommended at least one other individual to provide further information.

Overall, we recorded every interview, notated the interviewees' responses in real time, and referenced the Microsoft Teams' transcripts to capture all the data. To synthesize this data, we consolidated all of the interviewees' responses onto a single document, identified key themes, and looked for similarities and differences throughout the data set. Then we removed the duplicate answers and annotated any exceptions or apparent outliers in the dataset. In rare cases, we sent interviewees a follow-up email to obtain clarifications to the answers we received in our interviews. After we compiled all the responses, we reviewed the answers and applied them to the standards established within the GAO *Framework*. We also followed Guest, Namey, and Chen's (2020) approach to reaching saturation by conducting nine interviews and capturing the high-level themes. Then we conducted four more interviews to test saturation and determine if we captured most of the high-level themes needed to generate sufficient novel data for this study. The results of our interviews are presented in the next chapter.

C.   CORNERSTONES

Each cornerstone in the GAO *Framework* contains multiple elements, which the GAO states are "integral to effective stewardship at an organization" (GAO, 2005, p. ix). These elements depend upon critical success factors, and every cornerstone can stand alone in any given assessment (GAO, 2005). As a result, we had the flexibility to tailor our application of the GAO *Framework,* which enabled us to implement a high-level, qualitative assessment of RAPIDx's strengths and weaknesses. For our application of the GAO *Framework*, we evaluated the interviewees' responses to capture RAPIDx's best practices and identify our areas of concern. The best practices consisted of RAPIDx's strong aspects that other innovative organizations should replicate, whereas the areas of concern identified RAPIDx's weaknesses that require attention or remediation.

Given the constraints to our time, the number of questions originally developed for our interviews, and the perspective gained from our initial brief about RAPIDx, we decided to focus on the second cornerstone, *Policies and Processes*, and third cornerstone, *Human*

Capital, of the GAO *Framework*. These two cornerstones helped us distinguish the most significant characteristics of an innovative organization from those of a more traditional acquisition function. The first cornerstone, *Organizational Alignment and Leadership*, and fourth cornerstone, *Knowledge and Information Management*, of the GAO *Framework* are still useful to analyze, but they aligned better with more traditional acquisition organizational models. Therefore, the second and third cornerstones of the GAO *Framework* seemed to be the most likely cornerstones to provide us with insightful data, given the time constraints.

1. Cornerstone 2: Policies and Processes

The second cornerstone of the GAO *Framework* focuses on the policies and processes that govern an acquisition function's performance. This cornerstone contains three elements and eight critical success factors (GAO, 2005). We developed a total of 14 interview questions to evaluate RAPIDx's performance against this cornerstone.

a. Element 1: Planning Strategically

The *planning strategically* element consists of two critical success factors. The first critical success factor, *partnering with internal organizations*, requires us to consider whether and to what extent RAPIDx implements a multidisciplinary approach by engaging with a variety of stakeholders. The second critical success factor, *assessing internal requirements and the impact of external events*, requires us to consider whether RAPIDx tracks current events, is cognizant of agencywide needs, and tracks congressional mandates and other external initiatives (GAO, 2005). We developed five interview questions to evaluate RAPIDx's performance against this element.

b. Element 2: Effectively Managing the Acquisition Process

The *effectively managing the acquisition process* element consists of four critical success factors. The first critical success factor, *empowering cross-functional teams*, requires us to consider whether and to what degree RAPIDx engages in post-award contract management. The second critical success factor, *managing and engaging suppliers*, requires us to consider whether and to what extent RAPIDx develops and maintains

relationships with past, current, and potential industry partners. The third critical success factor, *monitoring and providing oversight to achieve desired outcomes*, requires us to consider whether and to what extent RAPIDx oversees contractor performance and develops its own staff of contracting professionals. The fourth critical success factor, *enabling financial accountability*, requires us to consider whether and to what extent RAPIDx tracks and communicates financial information (GAO, 2005). We developed seven interview questions to evaluate RAPIDx's performance against this element.

c.   *Element 3: Promoting Successful Outcomes of Major Projects*

The *promoting successful outcomes of major projects* element consists of two critical success factors. The first critical success factor, *using sound capital investment strategies*, requires us to consider whether and to what extent RAPIDx has an effective capital investment strategy. However, after receiving our introductory brief with RAPIDx, we found this first critical success factor to not be applicable, because RAPIDx does not receive funds to invest in major physical capital investment projects. Therefore, it did not make sense to develop a question to specifically evaluate RAPIDx on this critical success factor. On the other hand, the second critical success factor, *employing knowledge-based acquisition approaches*, is applicable and requires us to consider whether and to what extent RAPIDx obtains sufficient knowledge to monitor and improve its performance (GAO, 2005). Given the single relevant critical success factor, we only developed two interview questions to evaluate RAPIDx's performance against this element.

2.   **Cornerstone 3: Human Capital**

The third cornerstone of the GAO *Framework* focuses on an acquisition function's use and management of its human capital. This cornerstone contains four elements and eight critical success factors (GAO, 2005). We developed a total of 10 interview questions to evaluate RAPIDx's performance against this cornerstone.

a.   *Element 1: Valuing and Investing in the Acquisition Workforce*

The *valuing and investing in the acquisition workforce* element consists of two critical success factors. The first critical success factor, *commitment to human capital*

management, requires us to consider whether and to what extent senior leaders invest in RAPIDx's human capital. The second critical success factor, *role of the human capital function*, requires us to consider whether and to what extent RAPIDx employs and manages human resource specialists (GAO, 2005). However, after receiving our introductory brief with RAPIDx, we learned that there are no human resource specialists in RAPIDx to evaluate. Instead, Air Force Contracting (SAF/AQC) and the Contracting Career Field Manager manage RAPIDx's manning, and they do not reflect how RAPIDx ensures "that human capital professionals have the appropriate authority, competencies, and experience" (GAO, 2005, p. 32). Given this feedback, we only developed one interview question to evaluate RAPIDx's performance against this element.

b. Element 2: Strategic Human Capital Planning

The *strategic human capital planning* element consists of two critical success factors. The first critical success factor, *integration and alignment*, requires us to consider whether and to what extent RAPIDx grows and aligns its workforce to achieve organizational goals. The second critical success factor, *data-driven human capital decisions*, requires us to consider whether and to what extent RAPIDx leverages data to balance the size and workload of its workforce, as well as capture feedback from departing members (GAO, 2005). We developed four interview questions to evaluate RAPIDx's performance against this element.

c. Element 3: Acquiring, Developing, and Retaining Talent

The *acquiring, developing, and retaining talent* element consists of two critical success factors. The first critical success factor, *targeted investments in people*, requires us to consider whether and to what extent RAPIDx develops and implements a training strategy that invests in its members' knowledge and skills. However, after receiving our introductory brief with RAPIDx, we learned that RAPIDx's core members do not award any contracts or have the capacity for a formalized training staff. Therefore, it did not make sense for us to develop questions that explored how RAPIDx's training strategy influenced the planning, implementation, and sustainment of programs that do not exist within RAPIDx. The second critical success factor, *human capital approaches tailored to meet*

organizational goals, is applicable and requires us to consider whether and to what extent RAPIDx offers competitive incentives to attract and retain its workforce (GAO, 2005). Given the single relevant critical success factor, we only developed two interview questions to evaluate RAPIDx's performance against this element.

d.   *Element 4: Creating Results-Oriented Organizational Cultures*

The *creating results-oriented organizational cultures* element consists of two critical success factors. The first critical success factor, *empowerment and inclusiveness*, requires us to consider whether and to what extent RAPIDx obtains feedback from its members to develop organizational goals. The second critical success factor, *unit and individual performance linked to organizational goals*, requires us to consider whether and to what extent RAPIDx leverages a system to connect an individual's performance with RAPIDx's organizational goals (GAO, 2005). We developed three interview questions to evaluate RAPIDx's performance against this element.

D.   SUMMARY

In this chapter, we introduced the two cornerstones that we used to inform our interview questions. Furthermore, we explained how we conducted our interviews and collected the resulting data. Finally, we summarized the elements and critical success factors relating to the second cornerstone, *Policies and Processes*, and the third cornerstone, *Human Capital*, under the GAO *Framework*. In the next chapter, we discuss the results of our interviews.

V. RESULTS AND RECOMMENDATIONS

A. INTRODUCTION

In this chapter, we synthesize and present the data collected from our 13 interviews by applying these results to the second cornerstone, *Policies and Processes*, and the third cornerstone, *Human Capital*, under the GAO *Framework*. All of the responses collected from our interviews will inform the answers to our primary and two supplementary research questions. We must point out that we conducted the following analysis in an environment in which there were no direct, measurable outcomes (as listed in Section B as an area of concern). Thus, the best practices listed are based on the direct effect on each element, but not necessarily the final performance outcomes associated with PPOs. These results will also shape our recommendations concerning the GAO *Framework* and the future of RAPIDx. Furthermore, we will provide a sixth recommendation in our post review section, which we developed after we shared the completed assessment with our sponsors at RAPIDx.

B. RESULTS OF THE INTERVIEWS

In this section, we summarize the results of our 13 interviews. We also present tables that capture RAPIDx's best practices and areas of concern for each element under the GAO *Framework's* second and third cornerstones. This data helps us compare RAPIDx against each element and critical success factor that is relevant to this study in order to determine if RAPIDx meets all the criteria outlined within the second and third cornerstones of the GAO *Framework*.

1. Cornerstone 2: Element 1 – Planning Strategically

All nine of the original interviewees answered the five questions pertaining to the *planning strategically* element under the second cornerstone. The four follow-up interviewees provided responses that supplemented these answers. Of all these responses, we captured four best practices. We also identified one area of concern. The results from our interviews are shown in Table 7.

Table 7.   RAPIDx Best Practices from Cornerstone 2: Element 1

Critical Success Factors from Cornerstone 2, Element 1: Planning Strategically	RAPIDx Best Practices (+) and Areas of Concern (-)
a. Partnering with Internal Organizations	+ Leveraging LNO Network and Multi-Functional Teams
	+ Engagement with Academia, Industry, and AFWERX
b. Assessing Internal Requirements and the Impact of External Events	+ Leveraging Relationships, Social Networks, and Open Source News
	+ Rapid Communication through Microsoft Teams Channel
	- No Standard Operating Procedures

a.   Critical Success Factor 1: Partnering with Internal Organizations

We captured two best practices relating to the *partnering with internal organizations* critical success factor. The first best practice captured is *leveraging LNO network and multi-functional teams*. RAPIDx's LNO network consists of at least one contracting professional assigned to each SCO, along with LNOs attached to many operational and systems contracting units across every MAJCOM. Those who volunteer to support RAPIDx's efforts tend to be those who are intrinsically motivated and self-starters. Likewise, these members who form the *Coalition of the Willing* bring together multiple connections and perspectives that other members are not necessarily privy to. For example, the geographical and organizational diversity of this LNO network empowers RAPIDx members to employ multidisciplinary approaches by leveraging Airmen from various backgrounds, like finance and legal, to participate virtually from different locations. The flexibility offered by this LNO network promotes clear communication and enables Airmen to cooperate and identify innovative solutions regardless of one's physical location. RAPIDx's LNO network also promotes the integration of innovative contracting training opportunities for its members, as facilitated by the members' diverse experiences and perspectives through monthly LNO meetings.

The second best practice captured is *engagement with academia, industry, and AFWERX*. Like other effective network managers, RAPIDx's core team members spend a large portion of their time engaging with people hailing from non-traditional and emerging technology businesses, colleges, universities, and other innovative DAF organizations like AFWERX. By engaging with these individuals from all axes of innovation, RAPIDx serves as a locatable and approachable entry point for those entering the B2G marketplace. RAPIDx also integrates the different civilian perspectives with innovation initiatives and then coordinates them to an appropriate contracting unit for execution. For example, RAPIDx's core members attended the previous two Fed Supernova collider events at Austin's Capital Factory. Here, they connected with entrepreneurs and industry members to open the door for collaboration in pursuit of dual-use technology solutions for the DOD.

b. Critical Success Factor 2: Assessing Internal Requirements and the Impact of External Events

We captured two best practices relating to the *assessing internal requirements and the impact of external events* critical success factor. The first best practice captured is *leveraging relationships, social networks, and open source news*. The core members of RAPIDx leverage a variety of different sources to track new or pending legislation that might affect general acquisition policies and processes. Of all the sources, RAPIDx's most impactful source for tracking updates is its LinkedIn account (located at https://www.linkedin.com/company/r-a-p-i-d-x/). The over 1,400 followers connected to RAPIDx's LinkedIn account tend to provide the core team with the timeliest updates. RAPIDx also leverages its members' relationships built over years of networking to informally obtain the latest news. Moreover, its current organizational position under SAF/AQCP is useful, in that those who develop and implement contracting policies work in the same Policy Division. This colocation makes it easier for RAPIDx's core members to stay abreast of the latest contracting policies. Once obtained and synthesized, these core RAPIDx members share the latest news and updates in both their monthly LNO meetings and RAPIDx Microsoft Teams channel.

The second best practice captured is *rapid communication through RAPIDx's Microsoft Teams channel*. RAPIDx's Microsoft Teams channel functions as an open forum

where contracting professionals from around the globe can quickly communicate and share their ideas with each other at any time of the day. This channel facilitates knowledge at a rapid pace, because Microsoft Teams is readily accessible on a wide assortment of devices for the purposes of unclassified communication. RAPIDx's core team members also established a culture of informal and open communication within this channel, which enabled LNOs to connect with each other, ask questions, and share solutions without fearing reproach. Moreover, after securing initial connections with academia and industry, RAPIDx's core members can then reach out to all of the LNOs connected to this channel to quickly coordinate efforts from outside of the DAF to those inside of the DAF. Ultimately, this Microsoft Teams channel strengthens RAPIDx's ability to assess internal requirements, as they relate to a non-executing acquisition function, and it provides more touch points for RAPIDx to share news of external events.

The area of concern identified is *no standard operating procedures*. Given its small size and focus on innovation and network management, RAPIDx does not have an official set of standard operating procedures. Although the lack of standard operating procedures offers organizational flexibility, that flexibility comes with many tradeoffs. For example, by not having any standard operating procedures, RAPIDx lacks some sense of resiliency. If the RAPIDx's current team of core members changed jobs, then RAPIDx could undergo another significant pivot, as experienced during the transition from RAPiDx to RAPIDx. Similarly, RAPIDx lacks a systematic method for capturing or controlling the innovative ideas and solutions shared on the Microsoft Teams channel. Thus, RAPIDx could lose track of or fail to sustain innovative ideas shared in its channel.

2. **Cornerstone 2: Element 2 – Effectively Managing the Acquisition Process**

All nine of the original interviewees answered the seven questions pertaining to the *effectively managing the acquisition process* element under the second cornerstone. The four follow-up interviewees provided responses that supplemented these answers. Of all these responses, we captured six best practices. We also identified six areas of concern. The results from our interviews are shown in Table 8.

Table 8.   RAPIDx Best Practices from Cornerstone 2: Element 2

Critical Success Factors from Cornerstone 2, Element 2: Effectively Managing the Acquisition Process	RAPIDx Best Practices (+) and Areas of Concern (-)
a. Empowering Cross-Functional Teams	+ Hosting Industry Crosstalks
	+ Coordinating and Facilitating Communication Within LNO Network
	+/- Attending Innovation Conferences, Events, and Summits
	- Some Friction when Engaging with Non-Acquisition Government Entities
b. Managing and Engaging Suppliers	+/- Leveraging LinkedIn Connections
	+ Participating in Industry Days
	+ Leveraging LNO Network to Connect Suppliers with Appropriate Units
	- Limited Capacity to Maintain Relationships
c. Monitoring and Providing Oversight to Achieve Desired Outcomes	- No Measurable Outcomes
d. Enabling Financial Accountability	- No Budget to Promote Autonomy

a.   Critical Success Factor 1: Empowering Cross-Functional Teams

We captured three best practices relating to the *empowering cross-functional teams* critical success factor. The first best practice captured is *hosting industry crosstalks*. There are instances in which RAPIDx's core members invited innovative industry participants to attend the monthly LNO meetings and discuss the innovative solutions or type of innovative work their companies engage in. These crosstalks provided RAPIDx and its LNO network with opportunities to broaden their perspectives on the current state of the innovation ecosystem. The perspectives gained from these crosstalks empowered RAPIDx's LNOs to engage in further discourse with diverse stakeholders at the LNOs' home duty stations.

The second best practice captured is *coordinating and facilitating communication within the LNO network*. RAPIDx LNOs already participate in multi-functional teams when executing their daily workload. Thus, the LNO network acts as another forum for amplifying communication, in which contracting professionals can share their own established networks or contacts with each other. This coordination and facilitation of information within the LNO network makes it so that forming connections with the appropriate stakeholder is rarely, if ever, a problem for RAPIDx members.

The third best practice identified is *attending innovation conferences, events, and summits*. RAPIDx's members attend innovation conferences and mixers on a regular basis. Notable events that interviewees cited include the Venture Capital Forum at the Pentagon and Fed Supernova at the Capital Factory in Austin, Texas. By attending these events, RAPIDx's members get exposed to more industry perspectives, which have the potential to turn into Phase I and II awards that LNOs could then share with each other. However, based on our interviews, we could not verify the results of these connections, and this lack of visibility also makes this factor an area of concern and informs our most significant concern—*no measurable outcomes*.

The area of concern identified is *some friction when engaging with non-acquisition government entities*. The contracting professionals within RAPIDx's LNO network do not struggle with forming multi-functional teams. Instead, the real challenge comes with motivating the government personnel who come from other communities to show interest in and remain engaged in the multi-functional teams. Without the support of and continued engagement from the members belonging to non-acquisition government entities, the LNO network's influence and innovation initiatives are limited.

b. Critical Success Factor 2: Managing and Engaging Suppliers

We identified two best practices relating to the *managing and engaging suppliers* critical success factor. The first best practice identified is *leveraging LinkedIn connections*. The GAO *Framework* notes that cooperative business relationships result in improved responsiveness to changing conditions, and RAPIDx's LinkedIn account plays a key role in their ability to form cooperative business relationships. In fact, so many business

connections originated from LinkedIn that RAPIDx's core team members have not needed to actively survey or look for new companies. Instead, non-traditional businesses consistently reach out to RAPIDx through its LinkedIn account, which ultimately establishes many B2G relationships that can be later shared amongst the other members of the LNO network. However, based on our interviews, we could not verify how many of these connections translated into contract awards throughout the DAF. Also, there does not appear to be any other website or tool that RAPIDx consistently uses to establish connections with other potential suppliers. As a result, we also treat this factor as an area of concern.

The second best practice captured is *participating in industry days*. When possible, RAPIDx's core members and LNOs attend industry days to discuss the DAF's various requirements and meet with non-traditional businesses. By attending these events, RAPIDx's members get exposed to more industry perspectives, which can turn into contacts that get shared to members of the LNO network. However, based on our interviews, we could not verify the results of the connections made from industry days.

The third best practice captured is *leveraging LNO network to connect suppliers with appropriate units*. RAPIDx established a fast, repeatable process for identifying non-traditional businesses and linking them to an appropriate contracting organization. In particular, RAPIDx's core members leverage their known contacts and the Microsoft Teams channel to quickly facilitate connections. Without the LNO network, more manpower would be needed to connect non-traditional businesses with contracting units.

The area of concern identified is *limited capacity to maintain relationships*. With RAPIDx's core team consisting of only two full-time members and one part-time member, there is a limit to how much time they can dedicate to managing relationships with non-traditional businesses. RAPIDx's LNOs also lack the capacity to maintain relationships with these non-traditional businesses, because they are beholden to and must prioritize the demands and requirements of their home duty stations first. Additionally, RAPIDx does not have anybody assigned to fill the role of a commodity manager, who would otherwise maintain supplier relationships and oversee any type of feedback system between RAPIDx and the businesses it interacts with. Moreover, RAPIDx's efforts are more focused on the

initial effort to link suppliers with LNOs, whereas AFWERX is designed and manned to better maintain relationships with non-traditional and other innovation-oriented businesses. As a result, there is some concern regarding RAPIDx's ability to maintain relationships with all the new non-traditional businesses that its core members interact with on a daily basis.

c. Critical Success Factor 3: Monitoring and Providing Oversight to Achieve Desired Outcomes

The area of concern identified is *no measurable outcomes*. RAPIDx's lack of direct, measurable outcomes is the most significant concern identified and observed in this chapter. This matter is complicated by the fact that RAPIDx does not execute or manage contracts—SBIR or otherwise. As a result, there are no internally awarded contracts or acquisition processes that RAPIDx's core members can monitor. Moreover, once RAPIDx's core members connect a non-traditional business with the appropriate LNO or contracting organization, RAPIDx's core members do not monitor the progress or track the outcomes or issues that result from the connections they facilitate.

Simply put, this inability of RAPIDx's core members to monitor and provide oversight of the progress resulting from the connections that they help establish creates some additional problems for LNOs. For example, one of our interviewees conceded that:

> RAPIDx looks cool, sounds cool… you join "the band" and once you buy into the hype, they pack out and leave town… and you are left with administering a handful of other requirements with no customer support and no reach back support.

This particular interviewee explained that they were left to deal with the second and third order effects resulting from one of RAPIDx's connections when this member served as a member of the COVID-19 Task Force. For example, this member worked on a particular requirement that supported many different Air Force bases. However, when this member awarded the Phase I contract, that member had to use their home unit's Department of Defense Activity Address Code (DODAAC) for the contract award, because RAPIDx does not have its own DODAAC. This effort resulted in logistical and coordination issues. For example, by using their home unit's DODAAC, the Phase I purchase looked like it was

meant only for the member's base. This member received no additional support from RAPIDx and had to coordinate the resulting deliveries to each base while they carried out their other primary and additional duties.

Furthermore, the administrative burden of these RAPIDx-related purchases became a problem for this particular interviewee. With RAPIDx focused on making connections, the LNO's home unit had to resolve all the issues that pertained to delivery, reimbursement, and closeout. For example, one non-traditional contractor took over eight months to learn how to properly submit an invoice on the DOD's Procurement Integrated Enterprise Environment (PIEE) website. This LNO had to resolve this problem during their own downtime. AFMC also audited this member's purchase while they were deployed, and RAPIDx was not involved in this audit.

d.   Critical Success Factor 4: Enabling Financial Accountability

The area of concern identified is *no budget to promote autonomy*. RAPIDx does not use a financial management system, because RAPIDx does not have an established budget or any available funds to spend, to include funds for travel. Without a budget of any kind, RAPIDx lacks the autonomy to direct, coordinate, and be held accountable for the results of the connections it establishes. For example, RAPIDx has submitted a budget request for the past two years. However, since RAPIDx keeps getting realigned, the money they requested went to their previously assigned division. Consequently, RAPIDx has to continually request travel funds from AFWERX and other organizations to be able travel.

Additionally, the same interviewee who awarded the innovative multi-base solution as a member of the Acquisition COVID-19 Task Force noted that, because RAPIDx lacks its own pot of money, this member had to obtain funding from the crowdsourced units interested in receiving the innovative Phase I solution. These complications proved to be a significant challenge for this member. In the end, one wing fronted around $100 thousand dollars for the crowdsourced purchase, and it took four months for that wing to get reimbursed by all the other units.

3. Cornerstone 2: Element 3 – Promoting Successful Outcomes of Major Projects

All nine of the original interviewees answered the two questions pertaining to the *promoting successful outcomes of major projects* element under the second cornerstone. The four follow-up interviewees provided responses that supplemented these answers. Of all these responses, we did not capture any best practices. However, we identified two areas of concern, and we confirmed that one critical success factor does not apply to RAPIDx. The results from our interviews are shown in Table 9.

Table 9.   RAPIDx Best Practices from Cornerstone 2: Element 3

Critical Success Factors from Cornerstone 2, Element 3: Promoting Successful Outcomes of Major Projects	RAPIDx Best Practices (+) and Areas of Concern (-)
a. Using Sound Capital Investment Strategies	N/A
b. Employing Knowledge-Based Acquisition Approaches	- Leveraging *Coalition of the Willing*
	- No Measurable Outcomes

a.   Critical Success Factor 1: Using Sound Capital Investment Strategies

We did not capture any best practices or identify any areas of concern for this critical success factor. As explained in some of the interviews, RAPIDx does not have a budget or any guaranteed funds to spend. Moreover, there are no buildings or equipment dedicated solely for the use of RAPIDx members. Therefore, RAPIDx does not make capital investments themselves. Consequently, there is nothing RAPIDx does that can be used to provide an effective assessment against this critical success factor.

b. Critical Success Factor 2: Employing Knowledge-Based Acquisition Approaches

This critical success factor does not directly relate to RAPIDx's efforts. However, we still identified two areas of concern that loosely relate to the *employing knowledge-based acquisition approaches* critical success factor. The first area of concern identified is *leveraging Coalition of the Willing*. Since RAPIDx is supported by a *Coalition of the Willing*, there is only so many people available that are willing to promote RAPIDx's mission. Even then, the LNO role is not classified as a primary or additional duty. Therefore, some of the LNOs put forth minimal effort, because RAPIDx's core team cannot direct any LNOs to complete any type of work. Likewise, since some LNOs are not actively engaged or consistently attend the monthly LNO meetings, it is challenging for RAPIDx to obtain and share sufficient knowledge needed to democratize innovation.

The second area of concern identified is *no measurable outcomes*. Again, the lack of direct, measurable outcomes is a concern. Since its genesis, senior contracting leaders have not provided RAPIDx with any objective benchmarks or metrics. It is also challenging for RAPIDx to employ any knowledge-based acquisition approaches when it does not award or manage contracts. Instead, the loose metrics that RAPIDx has used thus far are focused on building the SCO LNO network and ensuring at least one LNO was attached to each contracting unit. Beyond that, most of our interviewees assumed that the DAF's innovation-related metrics were managed by AFWERX, not RAPIDx.

4. Cornerstone 3: Element 1 – Valuing and Investing in the Acquisition Workforce

All nine of the original interviewees answered the one question pertaining to the *valuing and investing in the acquisition workforce* element under the third cornerstone. The four follow-up interviewees provided responses that supplemented these answers. Of these responses, we captured one best practice. We also identified two areas of concern, and we confirmed that one critical success factor does not apply to RAPIDx. The results from our interviews are shown in Table 10.

Table 10.   RAPIDx Best Practices from Cornerstone 3: Element 1

Critical Success Factors from Cornerstone 3, Element 1: Valuing and Investing in the Acquisition Workforce	RAPIDx Best Practices (+) and Areas of Concern (-)
a. Commitment to Human Capital Management	+/- Leveraging *Coalition of the Willing*
	- Only Two Full-Time Billets Secured
b. Role of the Human Capital Function	N/A

a.   Critical Success Factor 1: Commitment to Human Capital Management

We identified one best practice relating to the *commitment to human capital management* critical success factor. The first best practice identified is *leveraging Coalition of the Willing*. RAPIDx's core team members consistently demonstrate their commitment to the LNO network by remaining approachable, treating their members as assets, and openly advocating for the growth of the LNO network. This effort appears to be one of the key reasons why the LNO network has grown to its current level of membership. Additionally, RAPIDx's core members promoted the mantra that once someone becomes a member of RAPIDx, that person will always be a member of RAPIDx. This mantra, along with the desire to democratize innovation across Air Force contracting, helped inspire more members to join the LNO network. As more people became LNOs, awareness of RAPIDx increased, which resulted in more contracting professionals joining the LNO network. This cycle helped fuel RAPIDx's growth.

However, we also consider the *Coalition of the Willing* to be an area of concern. In contrast to RAPIDx's full-time members, the amount of time that the LNOs invest in supporting RAPIDx's mission is highly variable. Some LNOs will spend a few hours per month on actions resulting from RAPIDx's referrals, whereas others invest many hours per month. Other LNOs may not volunteer any of their time to support RAPIDx. Despite this variability, RAPIDx's core team cannot hold any of its LNOs accountable regarding their level of involvement, because their participation is completely voluntary.

The other area of concern identified for this critical success factor is *only two full-time billets secured*. As noted earlier, RAPIDx core team consists of a couple of full-time members. These core, full-time members consistently invest more than 40 hours per week supporting RAPIDx's mission to democratize innovation. So, there is a limit to their availability and capacity. The more time these members spend on managing its workforce, the less time they have to interact with non-traditional businesses or connect them with other contracting organizations.

b.   *Critical Success Factor 2: Role of the Human Capital Function*

We did not capture any best practices or identify any areas of concern for this critical success factor. RAPIDx does not have anyone within the organization who fills the role of a human capital official. Consequently, there is nothing RAPIDx does that can be used to provide an effective assessment against this critical success factor.

5.   Cornerstone 3: Element 2 – Strategic Human Capital

All nine of the original interviewees answered the four questions pertaining to the *strategic human capital planning* element under the third cornerstone. The four follow-up interviewees provided responses that supplemented these answers. Of these responses, we captured no best practices. We also identified three areas of concern. The results from our interviews are shown in Table 11.

Table 11.   RAPIDx Best Practices from Cornerstone 3: Element 2

Critical Success Factors from Cornerstone 3, Element 2: Strategic Human Capital Planning	RAPIDx Best Practices (+) and Areas of Concern (-)
a. Integration and Alignment	- Missing Strategic Human Capital Plan
b. Data-Driven Human Capital Decisions	- Manually Updating LNO Directory
	- Limited Capacity to Track Workload

a. Critical Success Factor 1: Integration and Alignment

The area of concern identified for this critical success factor is *missing strategic human capital plan*. RAPIDx does not have a strategic human capital plan, because it does not employ any human capital officials. The interviewees could not identify any type of succession plan or explain how RAPIDx's lack of a strategic human capital plan would influence the future of RAPIDx. A few of the interviewees suggested that anyone who fills RAPIDx's core, full-time slots need to have the right type of personality. These interviewees also expressed their support for those currently filling RAPIDx's full-time roles, indicating that they were approachable, flexible, good at developing relationships with industry partners, good at providing feedback, and good with handling informal communication. These traits mirror those of effective network managers. However, their positive traits do not negate the fact that RAPIDx is missing a strategic human capital plan—a necessary feature for the *strategic human capital planning* element.

b. Critical Success Factor 2: Data-Driven Human Capital Decisions

We identified two areas of concern relating to the *data-driven human capital decisions* critical success factor. The first area of concern identified is *manually updating LNO directory*. RAPIDx uses two Microsoft Excel spreadsheets to track the membership of its SCO LNOs and general LNOs. One of RAPIDx's full-time members updates both of these spreadsheets. However, there is no method established for tracking or confirming when LNOs change contracting units or leave the Air Force. Therefore, as the LNO network continues to grow, there are more opportunities for errors to be made, and it will be harder for RAPIDx to ensure that its LNO directories are accurate.

The second area of concern identified is *limited capacity to track workload*. RAPIDx can only leverage the time of a couple full-time members. Due to their capacity limits, these full-time members are unable to develop a skills inventory that tracks or identifies who within the LNO network has a specific type of contracting experience or exposure to a certain innovation initiative. Similarly, RAPIDx's LNOs do not have the additionally capacity to track this workload, because their involvement in RAPIDx is voluntary. They still must fulfill their obligations to their full-time jobs, whatever and

wherever that might be. Just as RAPIDx cannot track when LNOs change contracting units, they do not have the capacity to conduct exit interviews with any of the LNOs who leave RAPIDx or the Air Force. As a result, there is no capacity to explore the performance measures or goals that can be used to evaluate the effectiveness of RAPIDx's human capital approaches.

6. Cornerstone 3: Element 3 – Acquiring, Developing, and Retaining Talent

All nine of the original interviewees answered the two questions pertaining to the *acquiring, developing, and retaining talent* element under the third cornerstone. The four follow-up interviewees provided responses that supplemented these answers. Of these responses, we captured three best practices. We also identified four areas of concern. The results from our interviews are shown in Table 12.

Table 12.   RAPIDx Best Practices from Cornerstone 3: Element 3

Critical Success Factors from Cornerstone 3, Element 3: Acquiring, Developing, and Retaining Talent	RAPIDx Best Practices (+) and Areas of Concern (-)
a. Targeted Investments in People	+ Hosting Monthly LNO Meetings
b. Human Capital Approaches Tailored to Meet Organizational Needs	+/- Leveraging *Coalition of the Willing*
	+/- Indefinite Membership
	- Only Two Full-Time Billets Secured
	- Competing Priorities

a.   Critical Success Factor 1: Targeted Investments in People

We identified one best practice relating to the *targeted investments in people* critical success factor. The best practice identified is *hosting monthly LNO meetings*. By hosting monthly LNO meetings, RAPIDx invests in and enhances the value of its LNO network. The monthly meetings often include some form of training that improves the LNOs' awareness and comprehension of topics, to include the SBIR program, CSOs, and the STRATFI/TACFI program. Also, LNOs who recently executed a SBIR Phase III award or

participated in any type of industry mixer leverage these meetings to teach other LNOs what they learned from these experiences. Moreover, the monthly meetings address contemporary updates to contracting policies, which the LNOs can then share with members of their respective contracting units.

b. Critical Success Factor 2: Human Capital Approaches Tailored to Meet Organizational Needs

We identified two best practices relating to the *human capital approaches tailored to meet organizational needs* critical success factor. The first best practice identified is *leveraging Coalition of the Willing*. By leveraging its volunteer workforce, RAPIDx is able to work around its manpower restrictions and instead maximize its ability attract skilled workers that can support RAPIDx's mission. Moreover, since anyone in contracting can volunteer to become an LNO, RAPIDx implements a fair and equitable approach to its onboarding process.

However, we also consider the *Coalition of the Willing* to be an area of concern. In particular, there is no guarantee that the LNO network will generate a sufficient number of volunteers to execute the mission, which introduces risk and generates some concern. There are a few incentives to get LNOs to volunteer and contribute to RAPIDx's efforts. For example, many interviewees referenced the sense of fulfillment they experienced when they exercised their patriotic duty and spoke about their desire to work on teams that pushed innovative solutions or supported the National Defense Strategy. Other interviewees mentioned their love for contracting and viewed RAPIDx as an avenue for sharing and expanding their love for this career. Some even conceded that their involvement as an LNO helped to distinguish themselves from their peers when it came time for quarterly or annual awards. Beyond these reasons, though, there are few other incentives for contracting personnel to volunteer and become LNOs for RAPIDx. Therefore, some of these motivations highlight that RAPIDx operates more like a volunteer organization.

The second best practice captured is *indefinite membership*. RAPIDx's core members promoted the mantra that once someone becomes a member of RAPIDx, that person will always be a member of RAPIDx. Consequently, RAPIDx is able to work

around its manpower restrictions and instead maximize its ability maintain its cadre of skilled contracting professionals by leveraging its growing list of LNOs.

However, we also consider the *indefinite membership* to be an area of concern. Anyone in Air Force Contracting can become an LNO. Yet, those who become an LNO may never be active or contribute anything to support RAPIDx, and these LNOs would always be members of RAPIDx. Simply put, there is no policy or process in place to ensure that LNOs provide value to the network or help LNOs maintain their engagement with RAPIDx. Give the aforementioned lack of direct, measurable outcomes, it would be impossible to quantify the vale to the network as well.

We also identified two other areas of concern relating to the *human capital approaches tailored to meet organizational needs* critical success factor. The third area of concern identified is *only two full-time billets secured*. At one point, RAPIDx was supposed to receive more full-time billets. However, senior leadership changes resulted in those additional billets getting redirected to a different organization. Unless senior leaders provide RAPIDx with more full-time billets, RAPIDx's core team members will continue to be limited in how much work they can accomplish.

The fourth area of concern identified is *competing priorities*. Competing priorities come in various forms. For example, senior leaders change positions every few years, and new senior leaders tend to have different priorities than the previous leaders. This type of turnover is commonplace for the DOD and DAF. However, RAPIDx suffers from inconsistent support from its senior leaders, which includes a lack of measurable, actionable, and auditable strategic goals for the organization. RAPIDx relied upon the support from senior leaders to function during its first few years of existence. Moreover, LNOs also struggle with many competing priorities, because LNOs are still beholden to their primary and additional duties at their home station first. Those duties will almost always trump the opportunities provided by RAPIDx. Consequently, the competing priorities that currently persist above and within the organization will ultimately impact RAPIDx's ability to explore human capital approaches.

7. Cornerstone 3: Element 4 – Creating Results-Oriented Organizational Cultures

All nine of the original interviewees answered the three questions pertaining to the *creating results-oriented organizational cultures* element under the third cornerstone. The four follow-up interviewees provided responses that supplemented these answers. Of these responses, we captured two best practices. We also identified two areas of concern. The results from our interviews are shown in Table 13.

Table 13.   RAPIDx Best Practices from Cornerstone 3: Element 4

Critical Success Factors from Cornerstone 3, Element 4: Creating Results-Oriented Organizational Cultures	RAPIDx Best Practices (+) and Areas of Concern (-)
a. Empowerment and Inclusiveness	+ Promoting Engagement in Monthly LNO Meetings
b. Unit and Individual Performance Linked to Organizational Goals	+/- Relating Performance and Goals to SAF/AQC Flight Plan
	- No Measurable Outcomes

a.   Critical Success Factor 1: Empowerment and Inclusiveness

The best practice identified for this critical success factor is *promoting engagement in monthly LNO meetings*. RAPIDx's core members promote engagement in their monthly LNO meetings. Their efforts encourage members of the LNO network to speak up, provide feedback, and get directly involved in shaping RAPIDx's trajectory and future initiatives. Consequently, many interviewees expressed that they felt a sense of ownership regarding RAPIDx's progress and achievements.

b.   Critical Success Factor 2: Unit and Individual Performance Linked to Organizational Goals

The best practice identified for this critical success factor is *relating performance and goals to the SAF/AQC flight plan*. RAPIDx's efforts and performance is directly tied

to the third objective under the third line of effort in the 2021 SAF/AQC flight plan, which is to optimize the acquisition experience by developing "RapidX support capability" (Air Force Contracting, 2021, p. 12). Many interviewees referenced this line of effort when they described how they linked their performance to organizational goals. This type of common purpose and linkage is a nice start for RAPIDx.

However, we also consider the *relating performance and goals to the SAF/AQC flight plan* to be an area of concern. This area of concern is best explained by the second area of concern identified, which is a recurring theme—*no measurable outcomes*. As of September 2022, nobody within RAPIDx could identify or define a set of direct, measurable outcomes that the organization should pursue. This lack of measurable outcomes might change in the future, pending the results of SAF/AQC's latest initiative— the A-P-S lens—which stands for *Alignment*, *Prioritization*, and *Simplification*. This effort from the DAF's senior contracting leaders seeks to make the SAF/AQC flight plan more aligned with the DAF's operational imperatives, while prioritizing and simplifying guidance to accelerate change (A. Trevino, personal communication, September 6, 2022).

For now, RAPIDx focuses its time and effort on building connections with non-traditional businesses and coordinating with other contracting units through the LNO networks. These actions are tough to measure, with the only tangible output being how many connections RAPIDx made within a specific time frame. Ultimately, these connections RAPIDx enables are subjective, since RAPIDx does not have a way to confirm that the connections it made resulted in the execution of contract awards for any innovative solution or technology. Consequently, RAPIDx members struggle to leverage metrics or provide data points to senior leadership to validate or justify its actions.

C.   RECOMMENDATIONS

This section contains our top five recommendations as of 26 October 2022. The first recommendation addresses our biggest area of concern—that RAPIDx lacks direct, measurable outcomes. The second recommendation addresses the need to adapt the GAO *Framework* to better evaluate new, agile, and innovative organizations. The three final

recommendations consist of actionable items that can shape, if not improve, the future effectiveness of RAPIDx.

1. Define Measurable Inputs and Outputs to Inform Outcomes

RAPIDx currently lacks direct, measurable inputs, outputs, outcomes, and the ability to monitor any spend resulting from the connections it secures. Even though RAPIDx was conceived as an agile and innovative organization, it can benefit from outcome measures. Leading minds in startup strategy and entrepreneurship still recommend that such organizations create actionable, accessible, and auditable measures of performance toward intended goals (Ries, 2011). Before RAPIDx can solidify its outcomes, it must first identify measurable inputs and outputs. Therefore, we recommend that RAPIDx identifies and defines inputs and outputs that are relevant to promoting its accountability and transparency. Below is a list of potential measurables that RAPIDx could attempt to use to shape the outcomes it seeks to achieve. We also recommend that, if RAPIDx attempts to define and track these outputs and senior leaders do not find value in these measurables, then RAPIDx can discard the old outputs, iterate, and develop new outputs until RAPIDx can point to direct, measurable outcomes. RAPIDx should also avoid using and dedicating time tracking vanity metrics. Vanity metrics do not provide any meaningful value, because they do not "demonstrate clear cause and effect" (Ries, 2011, p. 143). It may take a few iterations, though, for RAPIDx to determine which metrics do and do not provide value to the DAF's senior contracting leaders.

a. Potential Measurable Inputs

- Number of non-traditional businesses (or universities) contacted.

- Number of non-traditional businesses linked to LNOs.

- Number of hours spent on RAPIDx-related requirements.

- Number of SCO LNOs engaged (within a certain time frame).

- Number of general LNOs added (within a certain time frame).

- Number and type of events engaged with by RAPIDx members.

b.   ***Potential Measurable Outputs***

- Number of Phase I/II/IIB/III awards resulting from RAPIDx connections.

- Total money awarded from contracts resulting from RAPIDx connections.

- Number of innovative solutions that transitioned from Phase II/IIB to III.

- Number of manhours saved by innovative solutions.

- Customer feedback from the executing organizations that awarded contracts resulting from RAPIDx connections.

- RAPIDx's Yelp! Rating, if created, would help the organization track how well it is performing (Newcombe, 2015).

2.   Adapt the Second Cornerstone of the GAO *Framework* for Innovative Organizations

One minor adaptation can be made to the second cornerstone, *Policies and Processes*, when benchmarking innovative organizations. We recommend adding a new critical success factor to the *planning strategically* element, which we call *partnering with external organizations and potential partners*. For context, the *planning strategically* element "requires attention to the larger context within which acquisitions occur," (GAO, 2005, p. 13) which means that attention should also be given to other factors that are external to an agency's policies and processes (GAO, 2005). The first critical success factor, *partnering with internal organizations*, does not consider factors external to an agency. Instead, this critical success factor considers the relationships that exist within an agency. The other critical success factor, *assessing internal requirements and the impact of external events*, addresses the need to conduct market research while being "cognizant of congressional mandates, administration initiatives, socioeconomic policy objectives, governmentwide fiscal imbalances, and other factors external to agencies" (GAO, 2005, p. 14). However, this critical success factor focuses more on external factors like budgets and

government legislation. Neither critical success factor explores one of the key aspects that we observed with RAPIDx—engagement with academia and non-traditional businesses.

Some may argue that this gap is addressed in the *managing and engaging suppliers* critical success factor. However, the vast majority of our interviewees commented that RAPIDx does not have or maintain any supplier relationships. Instead, our interviewees explained that they leaned further to the left side of the acquisition timeline, engaging with businesses who are not yet described as suppliers.

Our new critical success factor, *partnering with external organizations and potential partners*, fills this gap. Many of the DAF's innovation initiatives seek to identify emerging technology solutions or create novel solutions. However, those private entities who engage in this type of innovation tend to not be the same, traditional businesses that the DAF interfaces with—like the aerospace DIB's five major defense contractors. As informed by some of RAPIDx's best practices in the *planning strategically* element, innovative organizations partner with non-traditional businesses to experiment and innovate. With this information, we created a list of *key questions*, what to *look for*, and *cautions* to consider when applying this new critical success factor to innovative organizations:

a.   *Key Questions*

- How does the agency identify innovative solutions and technologies that are currently in progress or recently realized?

- How frequent, if at all, is the agency engaging with members of academia and industry?

- Does the agency interact with other innovative organizations external to its department or organization when conducting market intelligence?

b. ***Look For***

- The agency empowers its members to communicate with members of academia and industry to determine the available and anticipated commercial technology capabilities.

- The agency frequently engages with members of academia and industry.

- The agency develops strategies that support the agency's missions rather than the needs of an individual unit.

- Innovative solutions and related information are shared with other government departments and organizations.

- The agency has structures in place that require coordination and facilitate open communication regarding innovative solutions with external agencies.

c. ***Cautions***

- There are limited to no mechanisms in place for coordinating engagements with academia and non-traditional businesses.

- There are limited to no mechanisms in place for sharing the market intelligence of available and anticipated innovative commercial technology capabilities with other government departments and organizations.

An updated version of the second cornerstone, adapted for innovative organizations, is shown in Table 14.

Table 14.   Second Cornerstone Adapted for Innovative Organizations

Cornerstone	Element	Critical Success Factor
Policies and Processes	Planning Strategically	a. Partnering with Internal Organizations
		b. Partnering with External Organizations and Potential Partners
		c. Assessing Internal Requirements and the Impact of External Events
	Effectively Managing the Acquisition Process	a. Empowering Cross-Functional Teams
		b. Managing and Engaging Suppliers
		c. Monitoring and Providing Oversight to Achieve Desired Outcomes
		d. Enabling Financial Accountability
	Promoting Successful Outcomes of Major Projects	a. Using Sound Capital Investment Strategies
		b. Employing Knowledge-Based Acquisition Approaches

3.   Keep the LNO Network, but Merge RAPIDx with AFRL/RGK

RAPIDx's current placement within SAF/AQCP should be temporary. After completing all of our interviews, we learned that AFWERX now has its own contracting capability through its AFRL/RGK office (C. Eiserman, personal communication, October 12, 2022). Therefore, the AFRL/RGK office is effectively executing the function that RAPiDx was originally designed to complete. Moreover, given the recent organizational realignment, RAPIDx's autonomy appears to be in flux. There is no indication that RAPIDx will be granted a budget of any size, and the number of billets for its core, full-time members does not appear to be increasing in the near future.

Despite these concerns, RAPIDx possesses a few key features that need to persist. First, RAPIDx built up strong brand recognition since 2018, given the core team's grassroots efforts and successful connections secured through its LinkedIn account. Second, RAPIDx's LNO network has connected the DAF's contracting professionals across many locations and levels of leadership. This network, which has an established battle rhythm for meeting and sharing ideas, promotes the communication and innovation culture that RAPIDx has tried to democratize since its genesis.

To ensure these two features survive, the RAPIDx brand should relocate and apply to AFWERX's AFRL/RGK office. This realignment would bring RAPIDx back to its

roots—providing contracting support for AFWERX's innovation initiatives. Additionally, if RAPIDx regained its execution function, then this alignment would give their efforts a more direct connection to measurable outcomes. Moreover, RAPIDx's full-time billets could be used to send contracting professionals to any of AFWERX's innovation hubs. These full-time members would still function as the central connectors that manage the LNO network, connecting contracting professionals with each other from around the globe. RAPIDx's core team members would continue to serve as boundary spanners within AFWERX, connecting non-traditional businesses and those belonging to other career fields with the appropriate contracting unit. Those already assigned to AFRL/RGK do not need to change their duties or responsibilities. Instead, they could become the information brokers or peripheral specialists that will help RAPIDx thrive.

Furthermore, by working under AFWERX, the efforts of RAPIDx's core team would better promote the use of multi-functional teams, given that AFWERX consists primarily of Airmen whose backgrounds do not include contracting. This integration would also reduce the likelihood of different government entities working separately while trying to solve the same type of problem. Additionally, RAPIDx would need to develop a communications strategy to inform the wider workforce about RAPIDx's new alignment, mission, and capability.

Finally, by having RAPIDx realigned under AFWERX, RAPIDx would be better prepared to track its initiatives and respond to contingencies that require innovative solutions. For instance, rather than relying upon their home station DODAACs, RAPIDx's LNOs could be granted temporary access to AFRL/RGK's DODAAC and given appropriate privileges in PIEE. This way, RAPIDx's LNOs can provide contract support for RAPIDx while avoiding some of the logistical headaches experienced by some of the LNOs who supported the Air Force's Acquisition COVID-19 Task Force. At the same time, RAPIDx can secure a greater level of transparency by having their LNOs' actions tied to its DODAAC.

4. Provide RAPIDx with Funding to Purchase an Enterprise Resource Planning System

The DAF should provide RAPIDx with sufficient funds to purchase an enterprise resource planning (ERP) system that RAPIDx's core team members can leverage to oversee the LNO network. ERP systems effectively normalize information by enabling data to flow between various sources and eliminate data duplication. ERP systems are so valuable that thousands of businesses use ERP systems to manage their daily activities, including those that relate to procurement, risk management, and supply chain operations. In short, ERP systems make organizations more transparent, and they function as a viable technology solution that integrates people, processes, and technologies (Oracle, n.d.).

As noted in our results, RAPIDx manually updates its LNO directory and has a limited capacity to track and follow up with the connections it makes. An ERP system would simplify and align many of RAPIDx's efforts, which would ultimately help RAPIDx's core team locate its LNOs who have specific experiences, work in specific locations, or have needed talents within the LNO network. Furthermore, an ERP system could help RAPIDx's core team track the connections LNOs have made with non-traditional businesses, along with tracking those who awarded any type of SBIR contract.

5. Strengthen Ties with the Defense Innovation Unit

The need to accelerate change and innovate applies to more than just the DAF—this necessity applies to the entire DOD. Innovation is a joint effort, but the current defense innovation ecosystem is disjointed. As noted in the introduction, there are more than 30 different innovation organizations trying to find and transition innovative commercial technologies into defense solutions. With so many organizations tackling innovation, we would not be surprised to learn about the duplicative efforts that these organizations might be exploring.

Therefore, RAPIDx, and by extension AFWERX, should strengthen its ties with DIU, an innovation organization that claims to be "the only DOD organization focused exclusively on fielding and scaling commercial technology across the U.S. military at commercial speeds" (Defense Innovation Unit, n.d.). By strengthening the relationship

between the Defense Innovation Unit (DIU) and RAPIDx, the DAF could ensure that its contracting units are deconflicting innovation efforts with other DOD organizations and are learning from each other's efforts and progress. Furthermore, the DAF would be helping the DOD find, develop, and transition innovative solutions and technologies to those who truly need it—the warfighter.

D.   POST RAPIDX REVIEW

On 28 October 2022, we shared our assessment with our sponsors at RAPIDx, who reviewed this entire MBA professional report and provided some feedback. In all, our RAPIDx sponsors provided 25 comments, ranging from minor administrative corrections to detailed responses for our recommendations. Of note, our sponsors emphasized that RAPIDx is more of a CONOP versus a formalized organization. They also explained that RAPIDx is not inextricably tied to the SBIR and STTR programs. If these programs would have expired, then RAPIDx would have still persisted and instead focused on promoting the use of other acquisition tools. Moreover, our sponsors noted that the post-award issues relating to the Acquisition COVID-19 task force were not unique to RAPIDx, but rather applied to many other units who awarded innovative and crowdsourced solutions during this time period. Finally, we learned that, as of the week of 17 October 2022, RAPIDx no longer resides under SAF/AQCP. RAPIDx is now more closely associated with AFWERX, but RAPIDx does not fall under AFWERX's formal chain of command or organizational structure.

In the end, we addressed 20 of our sponsors' comments on 28 October 2022 without harming the integrity of our research. Then we resolved the five outstanding comments and concluded the feedback with our sponsors on 1 November 2022. We concluded that, if RAPIDx wants to serve as a true acquisition function, then it should take on our top five recommendations. However, if RAPIDx is meant to be a purely innovative social network, then it should create and implement a communication strategy that clarifies its function, purpose, and expectations.

During this same time span, we also created two informal polls that some of our Air Force contracting officer and enlisted peers at the Naval Postgraduate School

completed to see if our sample of interviews from the main study was skewed. The first informal poll, called the *'22 Cohort Post RAPIDx Lecture Survey*, consisted of four questions. The first three questions were built using a Likert 5-point agreement scale, and the final question was open-ended. Eight of our peers in the Class of 2022 cohort, who were officers in Air Force Contracting and enrolled in the "815" Acquisition and Contract Management curriculum, completed this survey after they listened to our 90-minute RAPIDx presentation on 27 October 2022.

The second informal poll, called the *'23 Cohort RAPIDx Survey*, consisted of three questions. The first two questions were built using a Likert 5-point agreement scale, and the final question was open-ended. Nine of our peers in the Class of 2023 cohort, who were officers in Air Force Contracting and enrolled in the "815" Acquisition and Contract Management curriculum, completed this survey. Unlike the Class of 2022 cohort, these participants did not attend our 90-minute RAPIDx presentation on 27 October 2022. The results of both of the first and second informal polls are shown below.

1. Results of First Informal Poll

The first question stated, "I understood what RAPIDx's function was before the student lecture." Of all eight responses collected, two respondents answered, "strongly disagree," four respondents answered, "disagree," and two respondents answered, "neither agree nor disagree." None of the respondents answered with "agree" or "strongly agree." Therefore, none of our peers could confidently identify or explain RAPIDx's current function before our 90-minute presentation on 27 October 2022 as shown in Figure 17.

I understood what RAPIDx's function was before the student lecture.

Answered: 8   Skipped: 0

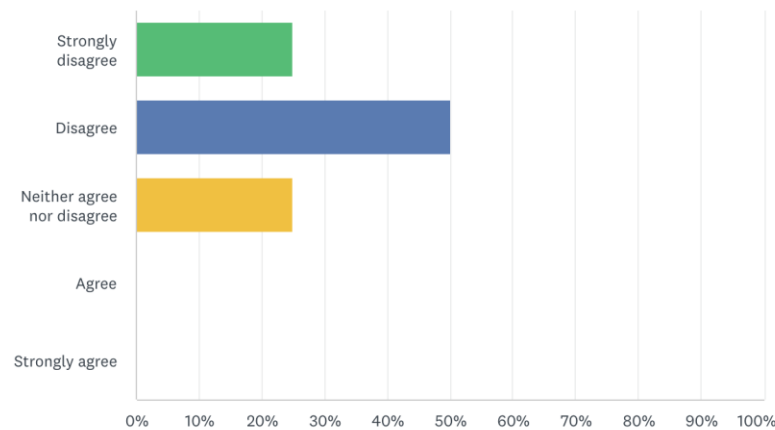| ANSWER CHOICES	RESPONSES	
Strongly disagree	25.00%	2
Disagree	50.00%	4
Neither agree nor disagree	25.00%	2
Agree	0.00%	0
Strongly agree	0.00%	0
TOTAL		8

Figure 17.   Question 1 Results of First Informal Poll

The second question stated, "I understand what RAPIDx's function is after the student lecture." Of all eight responses collected, two respondents answered, "strongly agree," five respondents answered, "agree," and one respondent answered, "neither agree nor disagree." None of the respondents answered with "disagree" or "strongly disagree." Therefore, most of our peers could confidently identify or explain RAPIDx's function after our 90-minute presentation on 27 October 2022, assuming our presentation accurately captured and explained RAPIDx's current function as shown in Figure 18.

I understand what RAPIDx's function is after the student lecture.

Answered: 8   Skipped: 0
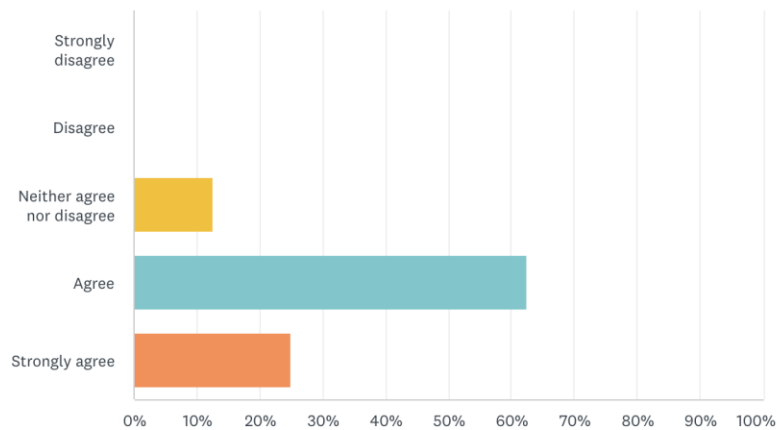
ANSWER CHOICES	RESPONSES	
Strongly disagree	0.00%	0
Disagree	0.00%	0
Neither agree nor disagree	12.50%	1
Agree	62.50%	5
Strongly agree	25.00%	2
TOTAL		8

Figure 18.   Question 2 Results of First Informal Poll

The third question stated, "It is clear what RAPIDx brings to the Air Force Contracting mission." Of all eight responses collected, one respondent answered, "strongly agree," five respondents answered, "agree," one respondent answered, "neither agree nor disagree," and one respondent answered, "disagree." None of the respondents answered with "strongly disagree." Although the responses were different slightly from the second question, most of our peers thought it was clear what RAPIDx brings to the Air Force Contracting mission after our 90-minute presentation on 27 October 2022, assuming our presentation accurately captured and explained what RAPIDx currently brings to the Air Force Contracting mission as shown in Figure 19.

It is clear what RAPIDx brings to the Air Force Contracting mission.

Answered: 8   Skipped: 0
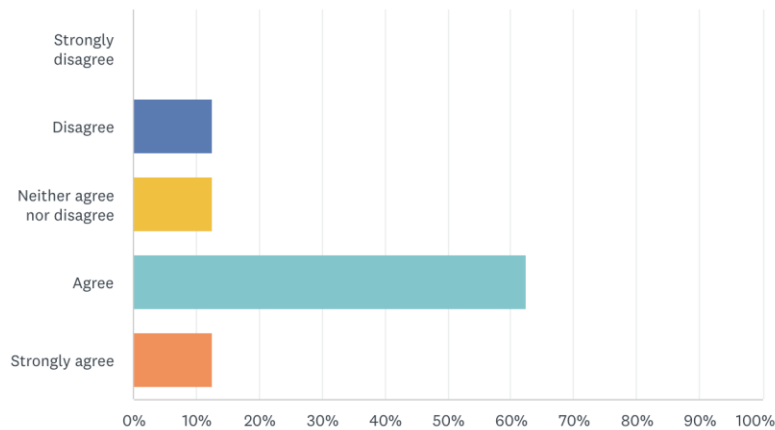
ANSWER CHOICES	RESPONSES	
Strongly disagree	0.00%	0
Disagree	12.50%	1
Neither agree nor disagree	12.50%	1
Agree	62.50%	5
Strongly agree	12.50%	1
TOTAL		8

Figure 19.   Question 3 Results of First Informal Poll

The fourth question asked, "How many years of contracting experience do you have?" Of the eight responses, the median years of contracting experience was 4.25 years. The minimum amount of contracting experience recorded was 1.5 years, whereas the maximum amount of contracting experience recorded was 11 years as shown in Table 15. The respondents' years of contracting experience did not skew their initial understanding of RAPIDx's function before attending the student lecture.

Table 15.   Question 4 Results of First Informal Poll

Years of Contracting Experience	
Mean	4.75
Median	4.25
Standard Deviation	2.93
Range	9.50
Minimum	1.50
Maximum	11.00
Count	8.00

Initially, all of the members of the Class of 2022 cohort reported that they had very little idea about RAPIDx and its function. Their perception of RAPIDx was not impacted by their years of contracting experience. The student lecture that we presented on 27 October 2022 seemed to somewhat help the members of the Class of 2022 cohort better understand RAPIDx's function. However, their confidence dipped slightly when asked if it was clear what RAPIDx brings to the Air Force Contracting mission. We also tried an ordered logistic regression to see if the respondents' years of contracting experience influenced each of their answers, and we found no significant results.

2.   Results of Second Informal Poll

The first question stated, "I know what RAPIDx is." Of all nine responses collected, three respondents answered, "strongly disagree," two respondents answered, "disagree," two respondents answered, "agree," and two respondents answered, "strongly agree." None of the respondents answered with "neither agree nor disagree." Therefore, more than half our respondents had never even heard of RAPIDx as shown in Figure 20.

I know what RAPIDx is.

Answered: 9   Skipped: 0
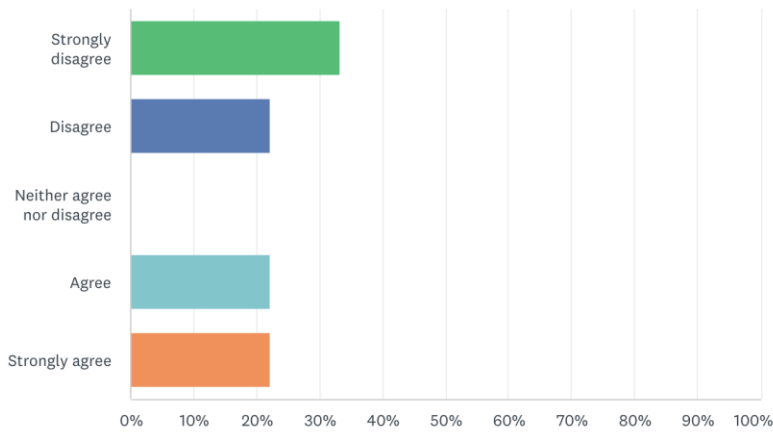
ANSWER CHOICES	RESPONSES	
Strongly disagree	33.33%	3
Disagree	22.22%	2
Neither agree nor disagree	0.00%	0
Agree	22.22%	2
Strongly agree	22.22%	2
TOTAL		9

Figure 20.   Question 1 Results of Second Informal Poll

The second question stated, "I know what RAPIDx brings to the Air Force Contracting mission." Of all nine responses collected, three respondents answered, "strongly disagree," three respondents answered, "disagree," one respondent answered, "agree," and two respondents answered, "strongly agree. None of the respondents answered with "neither agree nor disagree." Therefore, only one third our respondents knew or thought they knew what RAPIDx currently brings to the Air Force Contracting mission as shown in Figure 21.

I know what RAPIDx brings to the Air Force Contracting mission.

Answered: 9   Skipped: 0
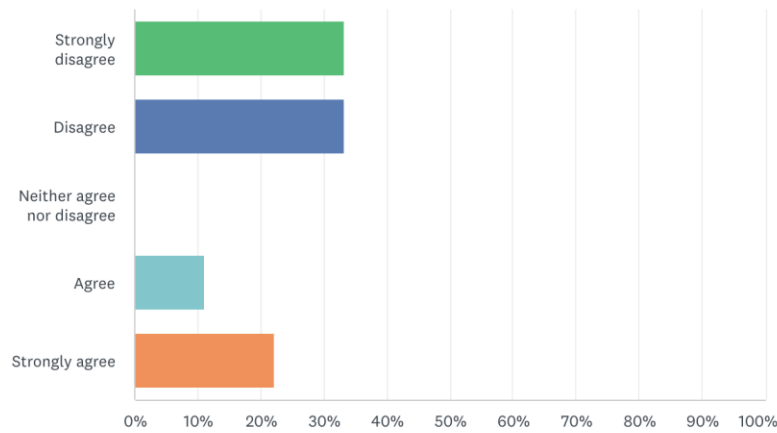
ANSWER CHOICES	RESPONSES	
Strongly disagree	33.33%	3
Disagree	33.33%	3
Neither agree nor disagree	0.00%	0
Agree	11.11%	1
Strongly agree	22.22%	2
TOTAL		9

Figure 21.   Question 2 Results of Second Informal Poll

The third question asked, "How many years of contracting experience do you have?" Of the nine responses, the median years of contracting experience was 3 years. The minimum amount of contracting experience recorded was 0 years, whereas the maximum amount of contracting experience recorded was 16 years as shown in Table 16. The respondents' years of contracting experience may have skewed the Class of 2023 cohort's answers to the first question of this second informal poll. The three respondents with the most years of contracting experience responded with "agree" or "strongly agree," whereas five of the remaining six respondents with six years or fewer of contracting experience responded with "disagree" or "strongly disagree." Similarly, the three respondents with the most years of contracting experience responded with "agree" or "strongly agree," whereas the remaining six respondents with six years or fewer of contracting experience responded

with "disagree" or "strongly disagree." Only one of these respondents claimed to know what RAPIDx was and answered that they did not know what RAPIDx brings to the Air Force Contracting. Although this sample is small, we ultimately observed that fewer respondents claimed to know what RAPIDx brings to the Air Force Contracting mission when compared to the number of respondents who claimed to know what RAPIDx is.

Table 16.   Question 3 Results of Second Informal Poll

Years of Contracting Experience	
Mean	4.75
Median	3.00
Standard Deviation	5.31
Range	16.00
Minimum	0.00
Maximum	16.00
Count	8.00

Ultimately, fewer respondents from the Class of 2023 cohort claimed to know what RAPIDx brings to the Air Force Contracting mission versus what RAPIDx is. Also, unlike the results captured in the first informal poll, the respondents' perceptions of RAPIDx in this second informal poll were more skewed by their years of contracting experience. In particular, the three respondents with the most contracting experience responded to the first two questions of this second informal poll with more confidence than the other respondents who had six years or fewer of contracting experience. Finally, we tried an ordered logistic regression to see if the respondents' years of contracting experience influenced each of their answers, and we found no significant results.

3.   Sixth Recommendation

Given the results of our study and these two informal polls, RAPIDx seems to have a general identity crisis within the workforce. The confusion may stem from its constantly shifting mission focus and organizational alignment. We are not certain about the cause, but we do recommend a best practice to combat this issue. RAPIDx should build a

marketing communications plan. This communications plan should seek to fulfill the following four objectives: (1) increase awareness of and participation in RAPIDx, (2) improve relationships between RAPIDx and industry, (3) provide resources to industry to facilitate greater participation, and (4) create reliable and consistent messaging that reflects RAPIDx's realistic expectations and experiences (Passarella & Ocampo, 2020). When creating this communications plan, RAPIDx should identify its internal and external stakeholders who would benefit or be impacted by this effort. RAPIDx should also consider practice market segmentation, in which RAPIDx separates its marketing efforts into quadrants based on the combination of an industry's level of information and level of availability. Furthermore, RAPIDx should leverage both print and digital media to raise awareness of RAPIDx's function and purpose (Passarella & Ocampo, 2020).

As it stands, RAPIDx has experienced many organizational changes up to and through the completion of this study. This constant change makes it difficult for anyone to understand RAPIDx's function and purpose. It is also challenging for RAPIDx to develop and implement an effective and coherent communication plan while it is in a constant state of flux. Therefore, RAPIDx needs to stabilize before it can clean up and improve its current marketing efforts. Special attention should be given to RAPIDx's LinkedIn page, which currently adds to the state of confusion, because the hyperlink referenced under the "Website" section on RAPIDx's LinkedIn webpage (http://82cons.com/services-table/) contains information that refers to RAPiDx.

Finally, RAPIDx could advertise its function and purpose by saying that "RAPIDx is a social network that shares best practices and alerts mission partners to new and emerging sources and technology." This way, RAPIDx is clear and concise when advertising its function and purpose to everyone else working both inside and outside of the defense innovation ecosystem.

E.   SUMMARY

In this chapter, we provided the results of our 13 interviews by (1) creating seven tables that outlined RAPIDx's best practices and areas of concern and (2) including a short narrative explaining the best practice or area of concern. We then used these results to

inform our six recommendations. The next chapter contains a summary of this entire study, a conclusion that answers our primary and two supplementary research questions, an acknowledgement of this study's many limitations, and a recommendation for how to further build upon our research.

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VI. SUMMARY, CONCLUSIONS, AND AREAS FOR FURTHER RESEARCH

A. INTRODUCTION

In this chapter, we conclude our report by summarizing our research. Then we present a conclusion that (1) encompasses the results of our interviews and (2) answers our primary and supplementary research questions. Finally, we acknowledge the limitations of our research and identify areas for further research.

B. SUMMARY

In this study, we assessed RAPIDx using the second cornerstone, *Policies and Processes*, and third cornerstone, *Human Capital*, under the GAO *Framework* and captured RAPIDx's best practices and identified some areas of concern. Our research focused on the way RAPIDx functioned and managed its organizational structure between July 2018 and September 2022. To better understand what RAPIDx did and where it fit within the defense innovation ecosystem, we explored innovation-related topics that included the SBIR and STTR programs, the aerospace DIB, the CSO program, and AFWERX. Our methodology consisted of nine structured interviews, supplemented with four unstructured interviews, which were informed by the second and third cornerstones under the GAO *Framework*. Our study ultimately offered insight and visibility into RAPIDx's overall effectiveness, which informed our recommendations for evaluating new, agile, and innovative organizations in this era of strategic competition.

C. CONCLUSIONS

1. Interview Results

Our first nine interviewees answered thirty structured questions, which were supplemented by four interviewees and informed by the second and third cornerstones of the GAO *Framework*. For each element of the second and third cornerstone, we created a table that captured RAPIDx's best practices and identified some areas of concern. We consolidated RAPIDx's 16 best practices and 20 areas of concern into Table 17.

Table 17.   RAPIDx's Best Practices and Areas of Concerns from the GAO
Framework

Cornerstone	Element	Critical Success Factor	RAPIDx Best Practices (+) and Areas of Concern (-)
Policies and Processes	Planning Strategically	a. Partnering with Internal Organizations	+ Leveraging LNO Network and Multi-Functional Teams
			+ Engagement with Academia, Industry, and AFWERX
		b. Assessing Internal Requirements and the Impact of External Events	+ Leveraging Relationships, Social Networks, and Open Source News
			+ Rapid Communication through Microsoft Teams Channel
			- No Standard Operating Procedures
	Effectively Managing the Acquisition Process	a. Empowering Cross-Functional Teams	+ Hosting Industry Crosstalks
			+ Coordinating and Facilitating Communication Within LNO Network
			+/- Attending Innovation Conferences, Events, and Summits
			- Some Friction when Engaging with Non-Acquisition Government Entities
		b. Managing and Engaging Suppliers	+/- Leveraging LinkedIn Connections
			+ Participating in Industry Days
			+ Leveraging LNO Network to Connect Suppliers with Appropriate Units
			- Limited Capacity to Maintain Relationships
		c. Monitoring and Providing Oversight to Achieve Desired Outcomes	- No Measurable Outcomes
		d. Enabling Financial Accountability	- No Budget to Promote Autonomy
	Promoting Successful Outcomes of Major Projects	a. Using Sound Capital Investment Strategies	N/A
		b. Employing Knowledge-Based Acquisition Approaches	- Leveraging *Coalition of the Willing*
			- No Measurable Outcomes
Human Capital	Valuing and Investing in the Workforce	a. Commitment to Human Capital Management	+/- Leveraging *Coalition of the Willing*
			- Only Two Full-Time Billets Secured
		b. Role of the Human Capital Function	N/A
	Strategic Human Capital Planning	a. Integration and Alignment	- Missing Strategic Human Capital Plan
		b. Data-Driven Human Capital Decisions	- Manually Updating LNO Directory
			- Limited Capacity to Track Workload
	Acquiring, Developing, and Retaining Talent	a. Targeted Investments in People	+ Hosting Monthly LNO Meetings
		b. Human Capital Approaches Tailored to Meet Organizational Needs	+/- Leveraging *Coalition of the Willing*
			+/- Indefinite Membership
			- Only Two Full-Time Billets Secured
			- Competing Priorities
	Creating Results-Oriented Organizational Cultures	a. Empowerment and Inclusiveness	+ Promoting Engagement in Monthly LNO Meetings
		b. Unit and Individual Performance Linked to Organizational Goals	+/- Relating Performance and Goals to SAF/AQC Flight Plan
			- No Measurable Outcomes

2.   Primary Research Question

How well does RAPIDx perform in the Policies and Processes and Human Capital cornerstones for efficient, effective, and accountable acquisition functions, as identified in the GAO Framework?

Overall, RAPIDx performed somewhat poorly in the *Policies and Processes* and *Human Capital* cornerstones. More specifically, for the second cornerstone, *Policies and*

Processes, we captured 10 best practices and identified seven areas of concern. Our biggest area of concern, which we observed across multiple elements, was that RAPIDx lacked any semblance of direct, measurable objectives. As a result, the best practices we identified were based on the direct effect that the practices had on each element, and not necessarily on the final performance outcomes. In truth, RAPIDx excelled by leveraging its LNO network to help create multi-functional teams and engage with innovators from academia and industry. RAPIDx also promoted rapid communication through its Microsoft Teams channel and obtained news quickly through RAPIDx's LinkedIn account and personal relationships with various entities. However, RAPIDx lacked a set of standard operating procedures and experienced some friction whenever they engaged with Airmen from non-acquisition backgrounds. RAPIDx also lacked the manpower capacity to manage relationships with non-traditional businesses.

For the third cornerstone, *Human Capital*, we captured six best practices and identified 11 areas of concern. Again, our biggest area of concern was that RAPIDx lacked any semblance of direct, measurable objectives that could tie the LNOs' individual performance with organizational goals. Despite this major concern, we identified RAPIDx's monthly LNO meetings as a best practice, and we observed that RAPIDx's core members consistently demonstrated their commitment to the LNO network by remaining approachable, treating their members as assets, and openly advocating for the growth of the LNO network. However, RAPIDx ultimately lacked the sufficient manpower needed to effectively manage its human capital, and there are concerns with how RAPIDx manages certain processes, such as manually-updating the LNO directory.

3. Supplementary Research Questions

Is the current version of the GAO Framework appropriate for analyzing new, agile, and innovative organizations?

Yes, as it currently exists, the GAO *Framework* is robust and appropriate for analyzing new, agile, and innovative organizations. However, depending on the maturity of the new, agile, and innovative organization, it may be challenging to identify the best practices or areas of concern relating to the *promoting successful outcomes of major*

projects element. From our experience, capital investment strategies and knowledge-based acquisition approaches align better with more mature organizations. Besides this single instance of incompatibility, all of the other elements and critical success factors discussed in this study are relevant to new, agile, and innovative organizations.

If necessary, how should the two cornerstones analyzed in this study be reshaped to improve how the Government measures the acquisition function of new, agile, and innovative organizations?

We recommend one minor adaptation be made to the second cornerstone, *Policies and Processes*, when analyzing new, agile, and innovative organizations. Specifically, we recommend adding a new critical success factor to the *planning strategically* element, which we called *partnering with external organizations and potential partners*. This new critical success factor addresses a gap that we observed during our study of RAPIDx. In particular, we observed that none of the critical success factors considered an agency's engagement with external partners, to include academia and non-traditional businesses. Therefore, our new critical success factor will help other evaluators consider whether, to what extent, and how effectively another innovative organization interacts with members of academia, non-traditional businesses, and other external innovation organizations at the beginning of the acquisition process. Beyond this minor adaptation, we also determined that no changes needed to be made to the third cornerstone.

D.   LIMITATIONS OF THIS RESEARCH

There are some limitations to our research. First, this MBA professional report is limited, because we interviewed members located primarily within the RAPIDx office and its LNO network. Due to some time constraints and the inward focus of the interview questions, we did not interview many individuals outside of the RAPIDx ecosystem, and we did not interview any of the contractors or non-traditional businesses impacted by RAPIDx's efforts. Second, our interview questions focused on the second and third cornerstones of the GAO *Framework*. Consequently, we did not generate enough content through our interviews to apply the first and fourth cornerstones of the GAO *Framework* to RAPIDx, leaving our overall application of the GAO *Framework* incomplete. Third, our

selection of interviewees contains bias, because we interviewed those who were either active in the organization, very interested in sharing their RAPIDx experience, or happened to be present in RAPIDx's monthly LNO meetings held in August. This likely means that our interviews contain a conservative bias, and there may be further areas for improvement, not less, should further exploratory interviews be conducted outside of the LNO network. Fourth, our research is limited in that we could not obtain any spend data that would otherwise bolster our evaluation and understanding of the RAPIDx office, because no spend data exists for RAPIDx. Fifth, due to some time constraints, this report is limited in that we did not compare RAPIDx against any of the other new, agile, and innovative organizations working throughout the DOD's innovation ecosystem. Finally, our study is limited given that RAPIDx's transition from an ad hoc contracting organization to CONOP was somewhat unclear and may have impacted our evaluation of RAPIDx in accordance with the GAO *Framework*.

E. AREAS FOR FURTHER RESEARCH

First, we suggest that future researchers continue to study RAPIDx by building upon this study. In particular, future researchers should reanalyze RAPIDx based on the details outlined in RAPIDx's future communications plan, as suggested in our sixth recommendation. Additionally, future researchers can focus more on RAPIDx's impact beyond the LNO network, to include AFWERX Spark, contracting organizations, and non-traditional businesses. When engaging other contracting organizations, future researchers could simultaneously collect spend data pertaining to the awarded contracts that resulted from RAPIDx's connections with those organizations. When expanding upon this study, future researchers could also apply the first and fourth cornerstones of the GAO *Framework* to RAPIDx. Furthermore, future researchers could compare RAPIDx to other new, agile, and innovative organizations in the innovation ecosystem.

We also suggest that future researchers apply the second cornerstone, *Policies and Processes*, and the third cornerstone, *Human Capital*, of the GAO *Framework* to AFWERX's new contracting arm, the AFRL/RGK office. This new office awards the Open Topic SBIR Phase 1 and 2 contracts (C. Eiserman, personal communication, October 12,

2022), which is a function we thought RAPIDx executed before completing this study. In addition to conducting a qualitative study, these interested students should also conduct a spend analysis, given that the AFRL/RGK office awards contracts and should have the resulting spend data readily available. Furthermore, researchers could conduct a similar mixed-method study by benchmarking other innovative organizations such as the Defense Innovation Unit, Kessel Run, Kobayashi Maru, and Space Camp.

APPENDIX A. FRAMEWORK FOR ASSESSING THE ACQUISITION FUNCTION (GAO, 2005)

Cornerstones	Elements	Critical Success Factors
Organizational Alignment and Leadership	Aligning Acquisition with Agency's Missions and Needs	• Assuring Appropriate Placement of the Acquisition Function • Organizing the Acquisition Function to Operate Strategically • Clearly Defining and Integrating Roles and Responsibilities
	Commitment from Leadership	• Clear, Strong, and Ethical Executive Leadership • Effective Communications and Continuous Improvement
Policies and Processes	Planning Strategically	• Partnering with Internal Organizations • Assessing Internal Requirements and the Impact of External Events
	Effectively Managing the Acquisition Process	• Empowering Cross-Functional Teams • Managing and Engaging Suppliers • Monitoring and Providing Oversight to Achieve Desired Outcomes • Enabling Financial Accountability
	Promoting Successful Outcomes of Major Projects	• Using Sound Capital Investment Strategies • Employing Knowledge-Based Acquisition Approaches
Human Capital	Valuing and Investing in the Acquisition Workforce	• Commitment to Human Capital Management • Role of the Human Capital Function
	Strategic Human Capital Planning	• Integration and Alignment • Data-Driven Human Capital Decisions
	Acquiring, Developing, and Retaining Talent	• Targeted Investments in People • Human Capital Approaches Tailored to Meet Organizational Needs
	Creating Results-Oriented Organizational Cultures	• Empowerment and Inclusiveness • Unit and Individual Performance Linked to Organizational Goals
Knowledge and Information Management	Identifying Data and Technology that Support Acquisition Management Decisions	• Tracking Acquisition Data • Translating Financial Data into Meaningful Formats • Analyzing Goods and Services Spending
	Safeguarding the Integrity of Operations and Data	• Ensuring Effective General and Application Controls • Data Stewardship

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APPENDIX B. INTERVIEW QUESTIONS

<u>Opening Questions:</u>

1. What is the purpose of RAPIDx? (The purpose could include its mission, vision, etc.)
2. What is RAPIDx's organizational structure?
3. What is/was your role in RAPIDx's organizational structure?

<u>Cornerstone 2 – Policies and Processes Questions:</u>

Element 1 – Planning Strategically

Partnering with Internal Organizations

4. Who are RAPIDx's primary mission partners or stakeholders?
5. How does RAPIDx develop and maintain relationships with other contracting offices and its mission partners?

Assessing Internal Requirements and the Impact of External Events

6. How does RAPIDx assess its mission partners' needs and develop acquisition approaches to meet their needs?
7. How does RAPIDx track new or pending legislation that might affect acquisition policies, processes, and workload?
8. What are RAPIDx's processes for dealing with unforeseen external events or emergencies?

Element 2 – Effectively Managing the Acquisition Process

Empowering Cross-Functional Teams

9. To what extent does RAPIDx use cross-functional teams?
10. How well or poorly does communication flow in these cross-functional teams?

Managing and Engaging Suppliers

11. What is the process RAPIDx uses to identify key vendors?
12. How does RAPIDx manage relationships with former, current, and future vendors?

Monitoring and Providing Oversight to Achieve Desired Outcomes

13. To what extent does RAPIDx monitor the contracts it awards?
14. What actions has RAPIDx taken to ensure that it has, or the organizations it supports have, adequate staff with the right skills, knowledge, and training to implement policies and processes and to oversee contractors?

Enabling Financial Accountability

15. How does RAPIDx record, track, and manage the financial data for the work the office completes?

Element 3 – Promoting Successful Outcomes of Major Projects

Employing Knowledge-Based Acquisition Approaches

16. What metrics or benchmarks does RAPIDx use to monitor its performance or demonstrate its capability?
17. How does RAPIDx learn lessons from or make improvements to its acquisition process?

Cornerstone 3 – Human Capital Questions:

Element 1 – Valuing and Investing in the Acquisition Workforce

Commitment to Human Capital Management

18. Can you describe RAPIDx's workload per person?

Element 2 – Strategic Human Capital Planning

Data-Driven Human Capital Decisions

19. What data or processes does RAPIDx use to manage or justify its manning?
20. How does RAPIDx determine the appropriate size of its LNO network?
21. How does RAPIDx track the workload of its acquisition personnel?
22. How does RAPIDx track and conduct exit interviews with departing employees or LNOs? If so, then how does RAPIDx capture the feedback?

Element 3 – Acquiring, Developing, and Retaining Talent

Human Capital Approaches Tailored to Meet Organizational Needs

23. What flexibilities does RAPIDx have, regarding its manning? Please discuss the results or implications.
24. What laws, regulations, or policies, if any, are limiting RAPIDx's manning.

Element 4 – Creating Results-Oriented Organizational Cultures

Empowerment and Inclusiveness

25. How has RAPIDx communicated its expectations and reported its progress with its members?

Unit and Individual Performance Linked to Organizational Goals

26. How is RAPIDx's performance linked to organizational goals?
27. How well does RAPIDx's performance and achievements translate to annual performance reports and the organization's goals?

Closing Questions:

28. What are RAPIDx's major concerns, that have not otherwise been addressed in this interview?
29. Do you consider RAPIDx's existence a necessity, luxury, or liability? Why or why not?
30. What recommendations would you give to the other service branches regarding the implementation of their own agile, innovative contracting organizations.

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