FY2015-2019 IC S&T INVESTMENT LANDSCAPE

ENSURING FUTURE CAPABILITIES ALIGN TO MISSION NEEDS

Intelligence Reform And Terrorism Prevention Act of 2004

Executive Order 12333 (1981)

Industrial R&D Funding Begins Exceeding Government R&D Funding in the US (Circa 1980)

National Security Act of 1947

Office of Strategic Services Disbanded (1945)

About the Cover:

The cover uses a red and blue double helix to represent multiple concepts relating to the Intelligence Community's (IC's) science and technology (S&T) efforts. For example, starting at the bottom and moving up the image on the cover one observes—in chronological order—a number of key "red" challenges and "blue" technological achievements in the history of the IC. The use of this construct was not chosen randomly, however. Akin to how the base pairs in strands of deoxyribonucleic acid (DNA) correspond to one another, researchers and technologists within the IC S&T enterprise aspire to create capabilities that link to the threat environment of today—and in the future. Lastly, and perhaps most importantly, the choice of a DNA strand is meant to convey the critical importance of basic research to the IC's mission.

Contents

Appendices

Figures and Tables

Figures

Tables

Foreword

FROM THE DIRECTOR OF NATIONAL INTELLIGENCE:

The U.S. Intelligence Community's (IC's) goal of integrating intelligence requires that all elements of the IC science and technology (S&T) enterprise work together to ensure that we have the tools required to meet policymaker and warfighter needs. IC elements continue to excel in their core S&T missions, and the *FY2015-2019 IC S&T Investment Landscape* builds on that strength and indicates where further preparation for the future is needed.

This *Landscape* represents a major step forward in our integration of research efforts to support the needs of operators, analysts, and decision makers. By comprehensively aggregating and relaying the intelligence needs of disparate stakeholders, the *Landscape* helps to ensure that our nation's intelligence advantage endures. This document—in concert with related, ongoing outreach efforts that comprise the broader Intelligence Science and Technology Partnership (In-STeP)—will be key to ensuring greater collaboration and load sharing in the research efforts of the IC S&T enterprise, the broader U.S. Government, and other partners—wherever they reside. These partnerships are key to our future success. I thank you for your help.

James R. Clapper
Director of National Intelligence
Office of the Director of National Intelligence

FROM THE CHAIR OF THE NATIONAL INTELLIGENCE MANAGEMENT COUNCIL

An integrated IC that optimizes mission capabilities, informs enterprise-wide decisions, and delivers relevant intelligence to our customers is key to our continued success. By sharing S&T investment portfolios and challenges through the *Landscape* and In-STeP, the IC and its partners can ensure that our critical mission needs are met and that a mutual understanding of IC and partners' requirements and capabilities emerges. My staff and I will actively support this document and In-STeP to better identify, prioritize, and develop strategies to address the IC's current and anticipated needs.

Anthony W. Vassalo
Chair, National Intelligence Management Council
Office of the Director of National Intelligence

FROM THE DIRECTOR OF SCIENCE AND TECHNOLOGY:

Ensuring that future capabilities align to anticipated mission needs is the responsibility of the IC S&T enterprise, and the *Landscape* empowers collaborative problem solving within the IC and beyond to achieve this goal. Recognizing the need to responsibly manage our resources, the *Landscape* also identifies opportunities to establish and expand upon partnerships with technology developers in other U.S. Government agencies, academia, industry, and our closest allies.

Feedback on this document or In-STeP can be provided to *S&TInvestment@dnits.ic.gov* (JWICS) or *S&TInvestment@dni.gov*. My staff and I look forward to hearing from you.

Dr. David A. Honey
Director of Science and Technology
Office of the Director of National Intelligence

This page was intentionally left blank.

EXECUTIVE SUMMARY

The United States Intelligence Community (IC) and its partners—in both the public and private sector—face many challenges. The IC science and technology (S&T) enterprise must clearly articulate the needs we must address, while continually re-focusing our internal efforts to ensure that future capabilities align to mission needs.

The *FY2015-2019 IC S&T Investment Landscape* helps guide IC S&T and industry research and development (R&D) through FY2019 and beyond, and provides a guide for decisions about the size and shape of subsequent programs and budgets. It champions IC-wide Needs, which do not map well to individual elements' functional responsibilities, and provides an opportunity for IC leaders and stakeholders, such as the National Intelligence Managers (NIMs), to directly affect the allocation of IC and industry R&D resources.

The *Landscape* is the IC's first attempt to link the Needs of integrated intelligence to the S&T trade space of the future, and it provides a means to efficiently allocate our finite R&D resources. The *Landscape* advances the Director of National Intelligence's (DNI's) leadership of the IC and relays many of the most pressing IC-wide Needs that ensuring global security requires. It affirms priorities to focus IC plans and actions for the next five years while providing direction to guide the development of IC capabilities.

Developing the *FY2015-2019 IC S&T Investment Landscape*

A critical part of crafting the *FY2015-2019 IC S&T Investment Landscape* was identifying and comprehensively aggregating intelligence Needs from across the IC. To accomplish this, the Office of the Director of National Intelligence (ODNI) Director of Science and Technology (DS&T) staff identified intelligence Needs from a variety of sources with differing perspectives: subject matter experts, program managers, specialized customers, and field end-users.

Once these IC-wide Needs were aggregated, they were filtered into categories that are aligned with either IC Functional Managers (FMs) or others who are best positioned to champion solutions to a given IC Need, as shown in Table 0.1.

Table 0.1: Categorization of IC-Wide Needs

Name	Description	Example Needs
Category Zero	IC-wide S&T challenge problems that enhance the fusion, processing, and/or dissemination of existing collection and analysis streams	Develop analytic tools to identify, capture, characterize, aggregate, re-characterize or highlight, and disseminate content within social media and web traffic
Category One	IC-wide S&T challenge problems that are best served by an individual Functional Manager	Rapid and accurate identification, classification, and counting of equipment observed in the field
Category Two	IC-wide S&T challenge problems that are potentially served by more than one Functional Manager	Develop 3D/4D visualization capabilities that can integrate and render multi-INT, multi-sensor, multi-modality, and other source data in near real-time.
Category Three	IC-wide S&T challenge problems that are best served by leveraging non-National Intelligence Program partners	Alternative means to estimate yield of sub-surface nuclear events.
Analytic Needs	Identified Needs that require additional analytic support.	Forecast and identify new technological developments.
Not Applicable	Needs that are deemed outside the scope of S&T- or analysis-related Needs.	Acquisition/procurement issues

By directly allocating user's Needs and related technical challenges to those FMs best suited to solving them, DS&T analysis indicates that retaining core competencies, coordinating across FMs, and engaging with non-IC partners will be necessary for the IC to succeed in the future, as shown in Figure 0.1.

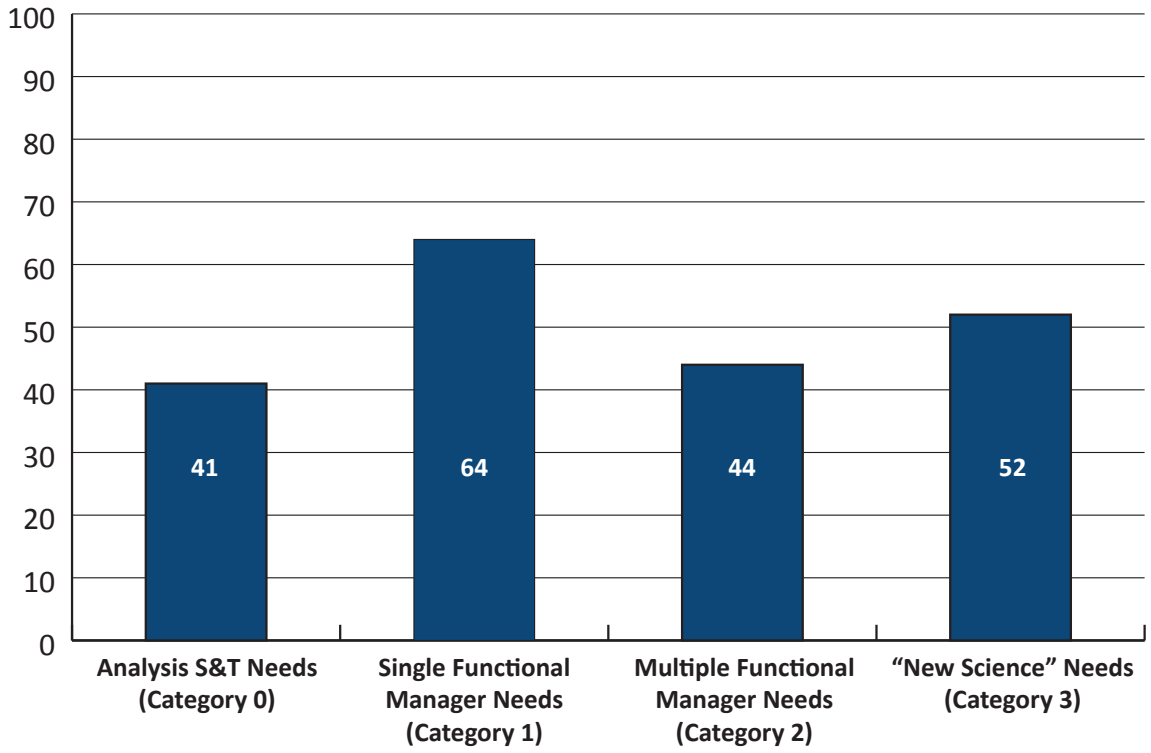


Figure 0.1—Breakdown of aggregated IC-wide S&T-related Needs by category. As the principal driver of IC integration, ODNI and its DS&T will coordinate Category Two activities, champion Category Three activities, and interface with non-IC partners to leverage resources and expertise. The ability to fuse and integrate is key for many Needs—a trend that, in DS&T's judgment, will only grow with time.

It is hoped that subsequent versions of IC-wide products will be prepared with the intent of encouraging interactions with the broader IC S&T enterprise. The importance of encouraging these interactions cannot be overemphasized and ensures that FMs' S&T endeavors aggressively pursue IC-wide Needs, in addition to those of the individual elements.

Application of the *FY2015-2019 IC S&T Investment Landscape*

The *Landscape* is the foundation of a longer-term IC S&T investment strategy. By sharing it with our partners and soliciting their feedback—particularly in combination with a Community-wide review of IC elements' existing and planned S&T investment portfolios—it provides IC leadership with a better understanding of where to bolster or reallocate scarce S&T resources. Building on this foundation, the DS&T developed the Intelligence Science and Technology Partnership (In-STeP) as the mechanism and process to assist the Community's investment decisions.

Via the *Landscape*, In-STeP communicates IC Needs to our partners early on in the process to improve planning and provide insight into the breadth of applicable S&T investments. Partner engagement and collaboration are essential to the success of the IC. To facilitate this communication and provide data for making investment decisions, the DS&T released the *Landscape* and asked for industry efforts related to solving the Needs. Additional In-STeP engagement outreach activities include periodic meetings where IC partners have the opportunity to engage the DS&T, the Director of National Intelligence Science and Technology Committee (NISTC)[1] , and the IC acquisition community.

"The "New Science" (Category Three) Needs will be the focus of future DS&T-led initiatives to organize, plan, and execute coordinated efforts that integrate the strengths of IC elements and leverage broad partnerships."

Additionally, the analytic Needs presented in this document are not meant to be limited to the IC elements' analytic resources, but rather to include the broader community the IC engages. The "New Science" (Category Three) Needs will be the focus of future DS&T-led initiatives to organize, plan, and execute coordinated efforts that integrate the strengths of IC elements and leverage broad partnerships.

It is critical in developing an IC-wide S&T strategy that the Needs of users and customers be closely coupled to decision making by technology subject matter experts so that new ideas are rapidly explored and the most salient technical advancements are exploited.

1 The NISTC is the DS&T-chaired standing body for the coordination and communication of S&T priorities and R&D investments across the IC.

CHAPTER 1
Introduction

Motivation for the Work

Pursuing the R&D of the technologies needed to achieve success in future IC missions is a key responsibility of the IC S&T enterprise. Future operators, analysts, and decision makers will face a complex and interconnected web of challenges for which today's technical capabilities are inadequate. Ensuring that the acquisition community is adequately prepared to respond to those future problems requires both a survey of the current landscape of challenges the IC faces as well as an investment strategy for creating S&T solutions. Given the requirement of maintaining the public trust, the IC S&T enterprise must carefully and responsibly choose where to invest its resources. Especially important to this process is the close coupling of the needs of users and customers to decision making by technology subject matter experts (SMEs) so that new ideas are rapidly explored and the most salient technical advancements are exploited.

Although the DS&T is well positioned to communicate with—and integrate Needs[2] data from—a wide variety of users and decision makers, the SMEs in the field are generally best positioned to make the project-level S&T investment decisions. To ensure the best use of S&T funds, it is also important to review progress against research goals, coordinate research activities and share information on results and recent developments. Within the IC, developing the S&T investment strategy for the IC S&T enterprise, reviewing progress, coordinating research activities, and ensuring that information is shared among S&T SMEs are activities led by the NISTC.[3]

IC Needs as S&T Investment Opportunities

The inputs describing current and future customer Needs for the *Landscape* are derived from a wide variety of source documents at all levels of the IC, including national intelligence strategy and intelligence analysis documents, Unifying Intelligence Strategies (UIS) from the NIMs and technical challenges from the components. The NISTC members are also directly linked to and support some of the input sources and thus provide a key resource for analyzing and understanding how to best meet these user Needs. Translating customer Needs into an actionable S&T investment strategy is therefore a key NISTC activity.

Forecasting the range of technology solutions and understanding the trade space of future opportunities is another important NISTC activity. Information for identifying important technology developments that should be followed comes to the NISTC membership from a number of sources—both inside and outside of the IC—but it is ultimately the responsibility of the research or mission elements to decide which technologies to pursue. Matching future IC missions with promising technology development opportunities is an important step in establishing investment prioritization and leads to deciding where and how to best invest resources.

2 For the purposes of the *2015-2019 IC S&T Investment Landscape*, we define 'Need' as an identified need based on the analysis of a number of sources that have undergone some level of broad vetting within the IC or through organizations that the IC supports. These sources are discussed in more detail in Chapter 2.

3 By statute, the NISTC is the standing body for the coordination and communication of S&T priorities and R&D investments across the IC. The NISTC is chaired by the DS&T, and its members include the principal science advisors of the National Intelligence Program (NIP). The Intelligence Reform and Terrorism Prevention Act of 2004 establishes and broadly describes the duties and functions of DS&T and the NISTC.

Many of the documented Needs contain a number of technologies that are required to deliver a system solution. Given the fiscal constraints the IC will likely continue to face, it is neither possible nor desirable for the IC to be a world leader in all technical areas all of the time. Often, as technologies mature, the Federal Government's share of the market for that technology decreases to the point where it becomes more readily available as commercial off the shelf (COTS) technology. When it moves from niche specialty to COTS item the ramp up in volume lowers the acquisition cost of those end items while simultaneously increasing yield, uniformity, and reliability. These cost and performance improvements benefit IC system acquisition although they can reduce the ability to influence upgrades and the inclusion of specific features of interest. While COTS items can be a great cost savings, changes in commercial markets can rapidly lead the development of items of interest into a new direction that does not meet IC Needs, or in some cases, can lead to obsolescence and the need to identify and procure an alternative solution.

Goals of the *FY2015-2019 IC S&T Investment Landscape*

This document is intended to guide IC S&T investments through FY2019 and beyond, provide a set of precepts to guide decisions about the the size and shape of subsequent programs and budgets, and highlight some of the strategic risks associated with the proposed strategy. It provides an opportunity for IC leaders and stakeholders, such as the NIMs, to directly affect the allocation of IC S&T resources and industry R&D efforts, and champions Community-wide Needs which lie beyond the scope of individual element functional responsibilities.

To accomplish these goals, the *Landscape* compiles IC-wide Needs as a *mechanism* for addressing these Needs by identifying *opportunities* for investment. The *Landscape* bridges individual IC elements' and Functional Managers' (FMs') strategies—which are often too tailored to the elements' and FMs' priorities—and documents such as the National Intelligence Strategy (NIS), which is generally too high-level to be useful in identifying specific S&T investment opportunities. Ideally, the *Landscape*:

- Bridges IC elements' existing strategies by discerning IC-wide Needs,
- Matches and assigns IC-wide Needs to FMs based on their capabilities and core competencies, and
- Leverages the resources of those outside the IC (other U.S. Government, industry, academia, U.S. allies) for those Needs best addressed by the broader U.S. and global industrial base.

CHAPTER 2

Consolidating, Categorizing, and Assigning Unmet IC-Wide Needs

An overarching DS&T objective is to generate—in an efficient and collaborative fashion—substantiated investment guidance for the DNI and the IC on technologies and capabilities to address the IC's Needs. This investment guidance is issued through collaboration with the IC elements and other ODNI offices during the development of the National Intelligence Program (NIP) - the Intelligence Planning, Programming, Budgeting, and Evaluation (IPPBE) process. The DS&T provides input and guidance to this process at several stages. One of the key outputs of this effort is the annual input to the DNI's Consolidated Intelligence Guidance (CIG), which provides amplifying guidance for the strategic priorities, major issue decisions, areas to assume risk, specific program guidance, and initial fiscal guidance for building the U.S. intelligence program and budget. This chapter describes how the DS&T surveys and aggregates IC-wide Needs and the important role that various Community leaders' documents play in the process of informing S&T-related portions of the CIG.

Surveying and Aggregating IC-Wide S&T Needs

A critical part of crafting the *Landscape* was identifying and aggregating intelligence Needs. To accomplish this in a manner calculated to reasonably catalogue most of the IC's Needs, DS&T staff sought out a variety of sources with differing perspectives: subject matter experts, program managers, and field end-users.

Published Cross-IC Subject Matter Expert Assessments. A cornerstone of the NIS is the appointment, designation, and empowerment of the NIMs from amongst IC element's SMEs. Constituted under the ODNI Deputy Director of National Intelligence for Intelligence Integration, the NIMs oversee and integrate all aspects of the IC's collection and analytic efforts against a particular region or function. Each NIM is the DNI's representative and focal point for the integration of all activities related to the issue. The NIMs maintain senior-level contacts with the intelligence, policymaking and warfighting communities so that the full range of intelligence requirements for a particular region or function is met. Lastly, NIMs set strategic guidance to improve long term IC collection and analysis, and are responsible for the development, planning, execution and success of the UISs and the orchestration of UIS activities by managing the policies and relationships among IC elements.

The NIMs are the designated DNI representatives for the 16 regional and functional areas shown in Table 2.1:

Table 2.1: NIM UISs Used to Derive Needs

Regional NIM Areas	Functional and Domain NIM Areas
Africa	Counterintelligence (NCIX)
East Asia	Counterproliferation (NCPC)
Eurasia	Counterterrorism (NCTC)
Europe	Cyber
Iran	Economic Issues
Near East	Military Issues
South Asia	Scientific and Technological Intelligence
Western Hemisphere	Threat Finance

The nature of the NIMs' missions and duties ensures that they are exposed to and able to assimilate a wide range of information sources as they produce definitive UISs. The DS&T staff carefully reviews each of the UISs to place defined Needs into a master list and to identify common and overlapping Needs for which solutions are likely to be found by applying new and innovative S&T. Because of the pivotal role the NIMs' UISs play in driving ODNI integration policy, the DS&T process is significantly influenced and driven by their representation and assessment of Needs.

IC Functional Manager Assessments. In the IC's lexicon, a *function* is an enterprise-wide intelligence activity or set of activities characterized by specific skill sets, data sources, and tasking, collection, processing, exploitation, analysis, and dissemination processes requiring specialized training, equipment, or unique applications of training or skills. The Functional Managers (FMs) are the principal advisors to the DNI on the performance of their function. FM responsibilities include maintaining knowledge of the totality of activities and resources pertaining to the function; advising on resource allocations; and evaluating the performance and overall effectiveness of the function against priorities established by the DNI. FMs' authorities include prescribing training, tradecraft, reporting, and function-specific technical architecture standards in compliance with DNI policies and guidance; advising IC R&D activities with regard to the function's most difficult problems; recommending services of common concern for their respective functions to the DNI; prescribing interoperability standards for function-dependent technical architectures in compliance with DNI policies and guidance; and advising the DNI on strategic management of resources in accordance with IC strategic management processes.

IC Functional Managers Are:

Director of NSA is the FM for SIGINT (Signals Intelligence)

Director of CIA is the FM for HUMINT (Human Intelligence)

Director of NGA is the FM for GEOINT (Geospatial Intelligence)

Director of DIA is the FM for MASINT (Measurement and Signature Intelligence)

Director of CIA is the FM for OSINT (Open Source Intelligence)

In this study, no Needs or investment opportunities are specifically mapped to OSINT; however, OSINT analysts share most of the Needs of all-source analysts and targeters.

DS&T Staff Interactions with Specialized Mission Managers. Periodically, specific threats and challenges generate interagency collaborative entities with a shared strategy and resource governance. Their specific Needs are sometimes unique so that the technological capabilities required to meet those Needs may also be unique, and, perhaps, of limited applicability to other missions. In some ways, these Specialty Mission Managers are their own subject matter experts best able to articulate and translate their own esoteric Needs.

DS&T Staff Field Site Visit Assessments. Not surprisingly, some cross IC Needs are enduring and have continuing investment, research and development. In these subject areas, the DS&T staff seeks to identify and visit end users applying current technical solutions to better understand mission objectives, operating environments, and technical impediments. This form of outreach to customer and users, though limited by time and resources, is a reality check on an otherwise headquarters and document-centric process. These field engagements build interest and support for the S&T process, and positions the staff to comprehend and describe additional facets of Needs sometimes insufficiently reflected in the assessment processes.

NISTC Assessments of Customer Needs. 50 U.S.C. § 3030 establishes a NISTC composed of "the principal science officers of the National Intelligence Program." Because NISTC officers administer the S&T programs within their elements day-to-day and year-to-year, they represent an institutional knowledge base of the evolution of Needs which informs the current and future Needs assessments. As such, their input is another overlapping element to the Needs survey and aggregation process and is solicited in the final stages as a validation and verification to ensure that as many Needs as possible are included and accurately described.

Integrated Priority Lists (IPLs). The IPLs are the U.S. Department of Defense (DoD) lists of combatant commanders' highest priority requirements—prioritized across service and functional lines—defining shortfalls in key programs that, in the judgment of the combatant commander, adversely affect the capabilities of their forces to accomplish their assigned missions. Although the IPLs are principally used to inform the DoD budget and program build, we included these Needs to inform funding decisions.

Verification Technology Research and Development Needs. The Verification Technology Research and Development Needs represent the Department of State Bureau of Arms Control, Verification and Compliance's priority needs for R&D programs to address critical arms control and nonproliferation technology requirements.

Categorizing and Assigning IC-Wide S&T Needs to Performers

Once the Needs were aggregated, they were filtered into categories based on which FM or other entity is best positioned to develop a solution to the Need, as shown in Table 2.2.

Table 2.2: Categorization of IC-Wide Needs

Name	Description	Example Needs
Category Zero	IC-wide S&T challenge problems that enhance the fusion, processing, and/or dissemination of existing collection and analysis streams	Develop analytic tools to identify, capture, characterize, aggregate, re-characterize or highlight, and disseminate content within social media and web traffic
Category One	IC-wide S&T challenge problems that are best served by an individual FM	Rapid and accurate identification, classification, and counting of equipment observed in the field
Category Two	IC-wide S&T challenge problems that are potentially served by more than one FM	Develop 3D/4D visualization capabilities that can integrate and render multi-INT, multi-sensor, multi-modality, and other source data in near real-time.
Category Three	IC-wide S&T challenge problems that are best served by leveraging non-National Intelligence Program partners	Alternative means to estimate yield of sub-surface nuclear events.
Analytic Needs	Identified Needs that require additional analytic support.	Forecast and identify new technological developments.
Not Applicable	Needs that are deemed outside the scope of S&T- or analysis-related Needs.	Acquisition/procurement issues

This method of basing decisions on performers[4] was selected to reduce the "binning" that often occurs when Needs are subdivided into various topical areas. The process of collecting and filtering these Needs is shown schematically in Figure 2.1.

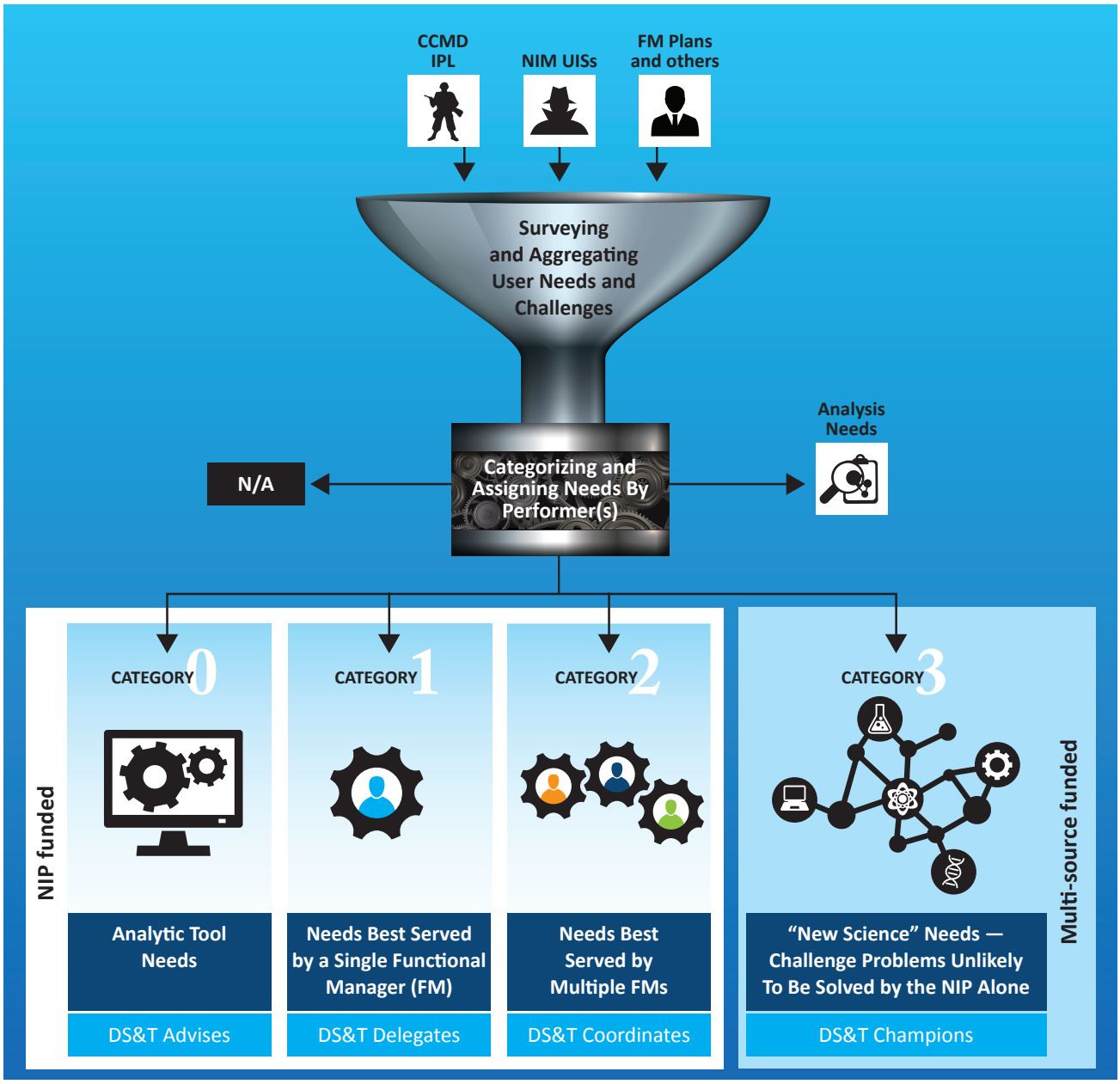


Figure 2.1—Selection process for assigning Needs to Performers. Note that from Category Zero to Category Three Needs, the role of the DS&T increases, moving from advising to ultimately championing S&T-related activities within the IC.

4 For the purposes of the *FY2015-2019 IC S&T Investment Landscape*, we define 'Performer' as the Functional Manager or set of Functional Managers responsible for meeting a Need.

Why Categorize By Functional Managers Instead of Program Managers?

The assignment of Needs to those with clearly defined, end-to-end intelligence mission alignment is critical to solving the Needs documented in the *FY2015-2019 IC S&T Investment Landscape*. Although there is some merit to assigning Needs to NIP Program Managers (PMs), their roles are primarily resource oriented—i.e., defined by budgets and personnel—and some PMs are not aligned to a single mission. The National Reconnaissance Program PM, for example, builds and operates platforms for multiple missions. Functional Managers, in contrast, are aligned along particular intelligence mission lines (GEOINT, SIGINT, etc.) and are directly responsible for accomplishing all aspects of their respective functions.

After the aggregated Needs were assigned to their respective Categories, they were then sub-categorized based on their areas of mission impact, as determined by DS&T analysis. These areas are presented in Table 2.3.

Table 2.3: Sub-categorization of IC-Wide Needs

Name	Description
Access Hard Targets	*Accessing Hard Targets* entails gaining access to challenging and time-sensitive targets.
Advance Cybersecurity	*Advancing Cybersecurity* capabilities allow the IC to understand, detect, and counter adversary cyber threats to enable protection of U.S. information infrastructure.
Advance Fundamental Understanding	*Advancing Fundamental Understanding* includes Needs where there is limited basic scientific understanding of the physical processes that are to be collected on or processed.
Detect and Characterize	*Detecting and Characterizing* describes activities to resolve intelligence information from data that is already collected.
Enable Cyberspace Operations	*Enable Cyberspace Operations* describes Needs related to advancing the state of the possible in the area of computer networks.
Evolve Operational Capabilities	*Evolving Operational Capabilities* includes activities and Needs designed to extend or enhance existing technical capabilities.
Fuse, Process, and Disseminate Information	*Fuse, Process, and Disseminate Information* capabilities enhance the ability to deal with increasing volume and disparity of information collected, help analysts make sense from information collected, and provide assured access to sources of information across IC components & ensure appropriate dissemination of IC products & services.
Maintain Collection Capabilities	To *Maintain Collection Capabilities,* the IC needs to protect current collection capabilities from adversary countermeasures and obsolescence.

CHAPTER 3

IC-Wide Needs Best Pursued by the Analytic Tools Community (Category Zero Needs)

Many Needs do not require the development of new collection or associated capabilities, but rather a better understanding understanding or fusing of existing data (or both). We denote this as a *Category Zero Need*.

Table 3.1: Needs Requiring Improved Fusion of Collected Intelligence Data

	Need #	Need
ACCESS HARD TARGETS	281	Create user defined queries to search across multi-INT data for conditions, states, changes, and detections and associate these events.
	282	Improve tip/cue tasking of multi-INT sources from user defined detection algorithms.
	297	Develop robust, accurate methods for rapidly predicting object signatures across multiple wavebands.
	298	Develop methods of creating flight and aerodynamic models from sensor data.
ADVANCE FUNDAMENTAL UNDERSTANDING	253	Develop tools to create scenarios, perform morphological analysis, and provide strategic foresight.
DETECT AND CHARACTERIZE	110	Provide advanced warning of isolated or coordinated threats by non-state actors to Western interests.
	111	Forecast and identify new technological developments.
EVOLVE OPERATIONAL CAPABILITIES	156	Develop methods to engage and integrate semantic, geospatial, contextual, visual, audio, and other data from global technical means; i.e., crowdsourcing, online repositories, social media, and publicly available digital archives.
	240	Develop statistical and behavioral analytics for the discovery of new phenomena.
	305	Improve methods for analyzing complex materials.
	307	Improved methods for interpolated CAD representations based on incomplete source data and estimates.
	371	High performance modeling and simulation tools at the phenomenology, system and architecture-level.

Table 3.1: Needs Requiring Improved Fusion of Collected Intelligence Data *(Continued)*

	Need #	Need
FUSE, PROCESS, AND DISSEMINATE INFORMATION	162	Agile, scalable, accessible, and reliable method of ingesting, searching, triaging, indexing, translating, processing, exploiting, and archiving disparate data.
	165	Develop software that can ingest information from a wide variety of sources, collate that information into user-defined categories, analyze fused data to highlight anomalies, trends, and continuity; incorporate autonomous agents able to alert humans or systems to changes or existence of pre-determined system states; display the information; and provide outputs in formats capable as serving as cueing feeds for other systems.
	166	Provide tools to integrate air, vessel and cargo-disposition TT&L data.
	169	Collaboration environment and tool suite to better analyze U.S. Government supply chains.
	172	Develop tools and procedures to facilitate enhanced dissemination of raw and finished INT.
	174	Develop tools and techniques to gather, analyze, and fuse socio-cultural data that reflects environment, threat factors, and partner activities.
	175	Improve readability, processing, storage, translation, and manipulation of large volumes of SIGINT and HUMINT data.
	176	Enhance analytic tools to identify, capture, characterize, aggregate, re-characterize or highlight, and disseminate content within social media and web traffic.
	177	Enable analysis of transportation data.
	180	Enhance tools to perform financial analysis.
	250	Enhance computer algorithms enabling automatic generated link analysis connections based on faces, voices, fingerprints, or other biometrics.
	302	Develop methods for rapidly analyzing the characteristics and vulnerabilities of integrated circuits and software.
	345	Promote data access while ensuring information security to allow information sharing among networks of varying security levels to enable collaborative intelligence analysis and information sharing.
	346	Develop technological solutions to maintain data provenance by marking intelligence data with “lifelong” metadata tags, which would propagate when data is used to newly create or aggregate data, but would allow updates, recall or repudiation, and/or transition to new data-marking processes and procedures.

Table 3.1: Needs Requiring Improved Fusion of Collected Intelligence Data *(Continued)*

	Need #	Need
FUSE, PROCESS, AND DISSEMINATE INFORMATION	347	Enhance tools to allow meaningful processing, searching, manipulation, and analysis of data across the IC, the U.S. Government, and state and local authorities to identify related information of interest while protecting the privacy of unrelated individuals and activities.
	352	Improve concepts for scalable implementations to efficiently process and manage large data elements and extract or create metadata.
	356	Enhance the content and accuracy of data through methods like aggregation and by understanding sources of error such as registration and conflation.
	359	Improve topic-centric, cross-domain, multi-source automated intelligence cycle management.

Table 3.2: Needs Requiring Additional Analysis and Improved Fusion of Collected Intelligence Data

	Need #	Need
ADVANCE FUNDAMENTAL UNDERSTANDING	16	Understand indicators of socio-economic, demographic and political instability.
	30	Understand and develop models to characterize reliability of economic data; gaps between perceived, measured, and actual investment, profitability, capacity utilization, employment, inflation rates, and gross domestic product.
DETECT AND CHARACTERIZE	53	Maintain situational awareness of adversary orders of battle, equipment, force movements and dispositions, military mobilization activities, and war preparations for adversary countries' populations and economies.
	54	Detect and characterize IED and associated networks.
	95	Detect efforts to radicalize individuals and to subsequently recruit to commit violent acts.
	138	Anticipate restriction or bans on the export of resources or subcomponents used in global manufacturing.

Table 3.2: Needs Requiring Additional Analysis and Improved Fusion of Collected Intelligence Data *(Continued)*

	Need #	Need
EVOLVE OPERATIONAL CAPABILITIES	219	Develop a concept of operations for a synchronized, layered I&W scheme.
	220	Develop and maintain a database of critical analytic skills across the IC to surge assets.
FUSE, PROCESS, AND DISSEMINATE INFORMATION	223	Exploitation of publications (journal articles, patents, etc…) to identify current and future trends by country and region, e.g. scientometrics.
	238	Enhance cross-domain solutions to protect against data leakages.
	375	Apply analytic techniques that quickly identify and penetrate orchestrated deception.

CHAPTER 4

IC-Wide Needs Best Pursued by a Single IC Functional Manager (Category One Needs)

Since the passage of the Intelligence Reform and Terrorism Prevention Act of 2004 and the subsequent standup of the ODNI, there has been a concerted effort to integrate the IC. Although this is useful for a number of purposes, such as intelligence sharing, our breakdown of IC-Wide Needs demonstrates that it also remains essential for FMs to maintain IC competencies in key areas. We have denoted these needs as *Category One Needs* to signify that they are, in our judgment, best served by a single FM.

The ODNI recognizes the deep expertise needed to pursue these Needs. The DS&T's role with respect to Category One Needs is to match these Needs with the FMs best suited to solve each, entrusting them and the entities originating the Needs to work together to find a solution. The FM or FM's designee would be expected to work directly with any public- and private-sector partners.

Table 4.1: Single IC Functional Manager Needs

	Need #	Need
ACCESS HARD TARGETS	208	Tools and technologies to facilitate language identification, familiarization, and quicker acquisition of fundamental language structures.
	209, 285	Develop and integrate standards to identify and address geospatiotemporal-driven data architecture requirements.
	276	Develop methods and capabilities to evade biometric and other identity analysis techniques.
	280	Create representations of entity activity reports that can be stored, queried and overlaid onto imagery and map displays.
	300	Develop methods for rapidly processing and analyzing signals.
	311	Continued development of geophysical methods for detection and characterization of all aspects of underground construction.
	313	Detect and analyze evolving Internet-enabled application layer communication protocols.
	316	Develop network analysis tools integrated into analyst workflows.
ADVANCE CYBERSECURITY	11	Provide a cybersecurity common operating picture.
	12	Perform near-real-time cyber forensics.
	14	Improve ability to detect and attribute cyberactivity.
	237	Create scalable cyber defense for environments dominated by strong encryption and advanced malware.
	348	Improve technical surveillance countermeasures.

Table 4.1: Single IC Functional Manager Needs *(Continued)*

	Need #	Need
ADVANCE FUNDAMENTAL UNDERSTANDING	36	Enhance understanding of polarimetry to provide both qualitative and quantitative improvements in object detection and identification and automated processing.
	37	Enhance understanding of the intersection of semantic narratives and geospatial phenomena in order to differentiate the abnormal from the normal.
	38	Develop new 'Human Geography' methodologies by combining behavioral and social sciences, mathematical and computational modeling, and both qualitative and quantitative aspects of geography to better understand and anticipate complex patterns and processes that shape human activity in relation to both the physical and social landscape.
	252	Develop and improve capabilities related to the collection, exploitation, analysis, and dissemination of documents and media.
	272	Develop means to validate and integrate external measurement and signature libraries.
DETECT AND CHARACTERIZE	56	Rapid and accurate identification, classification, and counting of equipment observed in the field.
	74	Detect human modification.
	84	Detect calmatives and incapacitating chemicals.
	96	Ascertain adversary network and command-and-control infrastructure.
	125	Develop new imaging technologies and improved integration and exploitation of imaging sensors to enable comprehensive situational and contextual awareness.
	127	Advance synthetic-aperture radar to track ground targets.
	128	Improve LIDAR ability to perform change detection, feature extraction and target recognition.
	133	Enhance capabilities to identify and track ballistic missiles.
	322	Enhance ability to detect deception using physiological signatures of stress and deception.
	324	Scientifically evaluate interviewing techniques.
	374	Enhance sensors and processing techniques that detect and penetrate sophisticated, widespread denial and deception.

Table 4.1: Single IC Functional Manager Needs *(Continued)*

	Need #	Need
ENABLE CYBERSPACE OPERATIONS	225	Enhance large-scale (robust) identity data exploitation and analysis.
	236	Create detailed cyber-physical mappings.
	242	Provide cyber situational awareness in a potentially-compromised environment.
	245	Develop robust automated and analyst-assisted cyber vulnerability detection tools.
EVOLVE OPERATIONAL CAPABILITIES	152	Develop new means of collecting signals.
	221	Enhance the capture or extraction of biometric data from video.
	301	Develop methods for rapidly processing and analyzing infrared emanations.
	308	Improved methods for collecting foreign test range data.
	327	Enhance tools to track and locate personnel and material using both active and passive means.
	332	Enhance capability to collect validated signatures such as fingerprint, face, iris, voice, palm, DNA and other biometric identifiers.
	333	Research nontraditional biometric signatures such as voice, gait, ear shape, or vascular patterns and behavioral traits such as typing patterns and speech usage.
	334	Perform rapid, proximal identification including the ability to quickly obtain high-quality facial/iris biometrics or finger prints with associated low false-positive performance.
	335	Develop tools to enable analysts to compare handwritten foreign language documents and identify documents written by the same author.
	338	Research and enhance systems using dynamic signals and protocols that sense and respond to the operational environment.
	339	Advance non-attributable secure global data and voice communication.
	367	Architecture precision navigation and timing.

Table 4.1: Single IC Functional Manager Needs *(Continued)*

	Need #	Need
FUSE, PRODUCE, AND DISSEMINATE INFORMATION	159	Advance photogrammetric techniques to enhance accuracy and timeliness of multi-dimensional position, geometric relationship, distance, and dimensional information.
	171	Provide cyber domain situational awareness.
	186	Advance SAR analytic techniques to support enhanced mapping, damage assessments, and subsidence analysis applications.
	187	Enhance the ability to perform photo-realistic visualizations and create high resolution models from LIDAR data.
	189	Leverage commercial datasets to correlate and reconstruct disparate objects, activities, and events within a spatiotemporal context.
	190	Discover, extract, and exploit geospatial content from unstructured and semi-structured text in near real-time.
	193	Improve tools able to seamlessly integrate, analyze, and visualize Building Information Model (BIM) data, CAD data, and GIS data in spatiotemporal contexts.
	194	Advance the state of Visual Analytics to improve human information perception and understanding of space, time, semantic meaning, and relationships between physical locations, features, and events.
	195	Enhance spatiotemporal analytics and MODSIM tools able to support integration of current and emerging ISR assets and nontraditional sources.
	198	Provide near real-time information to individual operators.
	239	Accelerate automated human language technologies for bulk processing with minimal machine learning corpora.
	273	Develop and refine human language technology (HLT) pipeline that enables greater efficiency of all language exploitation tasks that includes language identification, triage, gisting, summarizing, and translation.
	342	Improve the capability to preserve the forensic value, collection provenance, context and metadata as media are re-encoded and distributed.
	354	Maintain and enhance an accurate baseline of spatial-temporal and logical data to support discovery and search functions.
	390	Machine translation tools that enable translation of greater quantities of collected material without corresponding reliance on greater numbers of linguists or analysts.
MAINTAIN COLLECTION CAPABILITIES	207	Mitigate impacts of advanced tunneling technologies and related UGF S&T.
	232	Develop advanced cryptographic capabilities.
	341	Develop systems that keep pace with the myriad of operating systems, data formats, applications, encryption, and steganography.

CHAPTER 5

IC-Wide Needs Best Pursued by Several IC Functional Managers (Category Two Needs)

The previous Chapter illustrates the large number of problems that are best served by a single FM. In addition to those Category One Needs, our breakdown of Needs shows it is essential for FMs to work together to exploit IC competencies in key areas *exclusively within the realm of the National Intelligence Program*. DS&T denoted Needs that are best served by combining the skills of multiple FMs as Category Two Needs. This Category includes additional FMs or Analytic support (or both) for a better understanding of the Need. Below, we further delineate these Needs based on whether or not support from the IC's analytic community is required to address the Need.

As the Category Two Needs are more cross-disciplinary than those of Category One, the DS&T expects to play a stronger role, including potentially coordinating activities across participating IC elements through the NISTC.

Table 5.1: Category Two Needs Requiring the Coordination of Multiple IC Functional Managers

	Need #	Need
ACCESS HARD TARGETS	274	Improve means to periodically search broad regions for specific but low signal.
	314	Improve tools to collect and exploit emerging media and associated devices.
ADVANCE CYBERSECURITY	270	Improve ability to leverage communications infrastructure for high-data rate transmission.

Table 5.1: Category Two Needs Requiring the Coordination of Multiple IC Functional Managers *(Continued)*

	Need #	Need
DETECT AND CHARACTERIZE	55	Improve detection and localization of submarine communications.
	66	Develop additional means to identify tampering.
	78	Improve detection of transfer of Schedule 1 chemicals or precursors.
	79	Improve detection, tracking, and maintenance of geospatiotemporal history of WMD-related material, containers, or documents.
	82	Improve detection of WMD testing.
	85	Enhance detection and evaluation of testing of ASAT systems.
	88	Improve strategic and tactical detection and warnings of an adversary attack.
	89	Improve real time battle damage assessment of adversary facilities/events that may release hazardous materials.
	90	Enhance persistent strategic and tactical ISR capability in global maritime domain.
	94	Enhance ability to persistently monitor and detect changes in a nation's WMD facilities.
	123	Enhance identification, understanding, and targeting of transnational organized crime and related illicit drug trafficking activity.
	126	Improve differentiation and chemical analysis via lightweight mobile and handheld MSI and HSI sensors.
	267	Improve identification and characterization of signatures unique to a particular weapons system.
	318	Improve systems that detect electro-optic, infrared, and other signatures.
	319	Improve systems that to conduct network, biometric, chemical, biological, and radiological analysis.
	377	Advance IC capabilities to detect, localize, and analyze advanced RF communications.

Table 5.1: Category Two Needs Requiring the Coordination of Multiple IC Functional Managers *(Continued)*

	Need #	Need
EVOLVE OPERATIONAL CAPABILITIES	151	Enhanced means for unobtrusive on-site monitoring.
	157	Develop enhanced exfiltration methods.
	158	Improve means to find/fix/track mobile targets.
	192	Develop 3D/4D visualization capabilities that can integrate and render multi-INT, multi-sensor, multi-modality, and other source data in near real-time.
	370	Improved radiation protection for space systems.
FUSE, PROCESS, AND DISSEMINATE INFORMATION	168	Develop and refine Human Language Technology (HLT) tools for initial triage of large volumes of disparate data.
	355	Methods for affordable data (over its lifecycle) from collection of data, creation of content and reduction of storage while ensuring access to baseline information for currently known or potential analytical and user needs.

Table 5.2: Category Two Needs Requiring Analytic Support or Improved Fusion of Collected Intelligence Data

	Need #	Need
ACCESS HARD TARGETS	279	Characterize and mitigate threats to communications.
	399	Improve chain of custody monitoring of weapons and/or materials.
ADVANCE FUNDAMENTAL UNDERSTANDING	23	Develop theoretical and analytic means and methods to discriminate offensive (weapons development) biological activities from defensive programs or benign research.
	251	Identify and protect against threats to commercial-grade encryption.

Table 5.2: Category Two Needs Requiring Analytic Support or Improved Fusion of Collected Intelligence Data *(Continued)*

	Need #	Need
DETECT AND CHARACTERIZE	52	Improve detection and characterization of HDBT/UGF.
	63	Improve flight test monitoring to support assessment of delivery systems and compliance with restrictions on development and deployment.
	83	Enhance tools and techniques to support sampling and analysis of chemical weapons agents and their degradation products.
	92	Improve the ability to detect and identify intrusions into information technology systems.
	108	Enhance techniques to anticipate and identify WMD activities.
	116	Detect and characterize bulk cash smuggling/laundering.
	124	Provide warning of a mass migration event.
	137	Enhance ability to identify, characterize and track persons of interest.
	265	Detect and characterize terrorist R&D including goals, methods, and support.
EVOLVE OPERATIONAL CAPABILITIES	229	Enhance the capability to detect and attribute those who seek to harm us.
FUSE, PROCESS, AND DISSEMINATE INFORMATION	160	Improve ways to gather data from virtual worlds, extract meaning, and correlate to people, places, and events in the physical world.
	164	Increase capacity to ingest, decrypt, analyze, and store large volumes of disparate cyber data.
	181	Develop analytic and technical capabilities to extract relevant financial information from large datasets to identify effectively emerging threats to national security.
	199	Increase dissemination of collected data in native languages.

CHAPTER 6

IC-Wide Needs Requiring the Broader and Global Industrial Base (Category Three Needs)

The ODNI's *2012 IC S&T Estimate* concluded that the IC S&T community can no longer rely exclusively on internal R&D capabilities, or even the expanded community of IC, DoD, DOE, and U.S. commercial S&T. Instead, an active global campaign of investigation, collection, and outreach, driven by an informed IC S&T strategy, is required. The previous chapter demonstrated that despite the IC's breadth of capabilities, FMs need to work together to face a wide range of difficult problems. To address a number of Needs, however, it is essential that the IC leverage resources outside of the Community, often to achieve new levels of scientific understanding.

Further analysis of the potential solutions to these Needs is required. The need to develop new techniques and new partnerships to solve them should be apparent, as is the opportunity to leverage existing resources into new cross-community programs. The DS&T encourages engagement with partners to provide solutions to these increasingly intractable problems.

As demonstrated in Table 6.1, the Category Three Needs are naturally more cross-disciplinary than those of Categories One and Two—touching at least several elements and Functional Managers across the NIP as well as performers outside the IC. DS&T will seek to drive and champion a number of these Needs, subject to budgetary and staffing constraints, across the IC through FY2019.

Table 6.1: Needs That Must Leverage the Broader U.S. and Global Industrial Base

	Need #	Need
ACCESS HARD TARGETS	248	Alternative means to estimate yield of sub-surface nuclear events.
	249	Improve capability to collect and process physical evidence of WMD-related activities.
	283	Create IC standards for Activity-Based Intelligence (ABI) metadata.
	385	Research quantum computing and quantum key management technologies.
ADVANCE FUNDAMENTAL UNDERSTANDING	17	Develop the concept of "public verification challenges" and the role of public incentives in conjunction with social media to develop information.
	18	Determine if there are stable and effective counters to efforts to constrain or undermine online, civil information flow.
	19	Enhance understanding of the information ecosystem: advantages and limitations of tweets, photos and videos for information discovery; roles of moderators and/or network nodes in shaping the discourse in social media and efforts to influence or constrain information flow; and to what extent new media may supplant or supplement other forms of reporting.
	27	Enhance understanding of international financial networks and national economic trajectories.
	28	Enhance understanding of WMD, and WMD R&D or production, associated phenomenologies.
	29	Increase understanding of the factors that mobilize individuals to violence.
	31	Test and refine Activity-Based Intelligence (ABI) theoretical concepts.
	39	Enhance ability to quantitatively assess error propagation in the contexts of logic; completeness; data provenance; temporal accuracy; and semantics.
	40	Increase productivity and accuracy of vernacular language processing.
	258	Enhance anticipatory capabilities to identify and characterize individuals, organizations and crowd decision dynamics.
	391	Discovery of new sensing phenomena.
	392	Explore uses of metamaterials.

Table 6.1: Needs That Must Leverage the Broader U.S. and Global Industrial Base *(Continued)*

	Need #	Need
DETECT AND CHARACTERIZE	57	Determining whether a nuclear explosive test has occurred/rapidly determine whether an explosion is nuclear or conventional, to include tests in space and underground.
	58	Enhance ability to detect, classify, localize and track undersea threats.
	59	Enhance tools to discover and analyze highly diluted information present on social media.
	61	Improve standoff detection of strategic and non-strategic nuclear warheads.
	62	Tools or processes for verification of nuclear warhead production, dismantlement and elimination.
	69	Enhance non-destructive assay of plutonium in spent nuclear fuel.
	70	Sharable detectors of controlled nuclear materials.
	71	Detect and characterize signatures in the electromagnetic (EM) spectrum.
	72	Develop methods to detect and classify biological materials and differentiate hazardous substances.
	73	Enhance forensic tools to detect bio-agents.
	86	Detect and track ICBMs.
	87	Develop low observable long dwell platforms.
	91	Enhance means to detect, track, and characterize activities under canopy or in heavy foliage.
	114	Warn of and monitor space events which may affect space operations or global interests.
	115	Detect, characterize, attribute and track nuclear material/radionuclides.
	130	Detect and attribute efforts to interfere with or damage satellite operations.
	135	Anticipate, identify, and characterize anomalies on space systems and their supporting infrastructures.
	266	Expand and improve space launch characterization and tracking.
	323	Research psychological aspects of persuasion and social influence to create scientifically-vetted strategies to influence behavior and educe accurate information.
	325	Understand the culture of extremist behavior and terrorism as well as social science foundations of behavior, influence, and counter-messaging operations.
ENABLE CYBERSPACE OPERATIONS	226	Provide stable (persistent) cross-platform exploitation.

Table 6.1: Needs That Must Leverage the Broader U.S. and Global Industrial Base *(Continued)*

	Need #	Need
EVOLVE OPERATIONAL CAPABILITIES	132	Improve global detection of satellite launches.
	153	Develop new capabilities to monitor activities associated with UGF.
	330	Expand the library of source signatures for attribution associated with chemical, biological, radiological, nuclear, and explosives (CBRNE) material and weapons.
	362	Enhance space situational awareness sensors and tools.
	368	Advanced materials and structures (light-weight, strong, cost effective).
	369	Advanced power (light-weight, high capacity, long life, etc).
	372	Revolutionary, cost-effective launch capabilities.
FUSE, PROCESS, AND DISSEMINATE INFORMATION	161	Integrate robust tools to conduct cross-discipline link-analysis, visualization, foreign-language translation, and geospatial and other technical analyses within collaborative environments.
	182	Fuse, georectify, and visualize vast quantities of diverse geospatial and spectroradiometric data.
	183	Enhance analytic tools that exploit spatial and temporal content and context, enabling determination of similarities, differences, physical & proximal linkages, and hidden patterns and relationships across space-time.
	184	Understand the unique spectral and spatiotemporal content/context of geospatial analysis within emerging high-performance computing and cloud architectures.
	185	Advance video and electro-optical processing and analysis to incorporate adaptive, multi-scale indexing; automated discovery and analysis; and automated feature detection within video search capabilities.
	191	Leverage the 'Internet of Things' to provide dynamic situational awareness of human activity and behavior.
	200	Simulate the effectiveness of future counterspace systems at a level sufficient to prepare full-scale engineering assessments.
	202	Adapt sensor analysis tools and techniques to emerging nontraditional systems and platforms.

CHAPTER 7

Conclusions and Recommendations

Analysis of IC Needs

Traditional and non-traditional IC performers alike can provide unique solutions to inform and warn decision makers and warfighters and protect our common security. R&D lie at the heart of the Community's ability to create the innovative tools and capabilities needed to collect and analyze intelligence, perform covert action, and support specialized operations for counterintelligence, counterproliferation, and counterterrorism. By directly relaying policymakers' Needs and related technical challenges to the FMs best suited to solving them, DS&T analysis indicates that both the retention of core competencies and improved coordination is necessary for the IC to succeed in its future missions. This is shown in Figure 7.1.

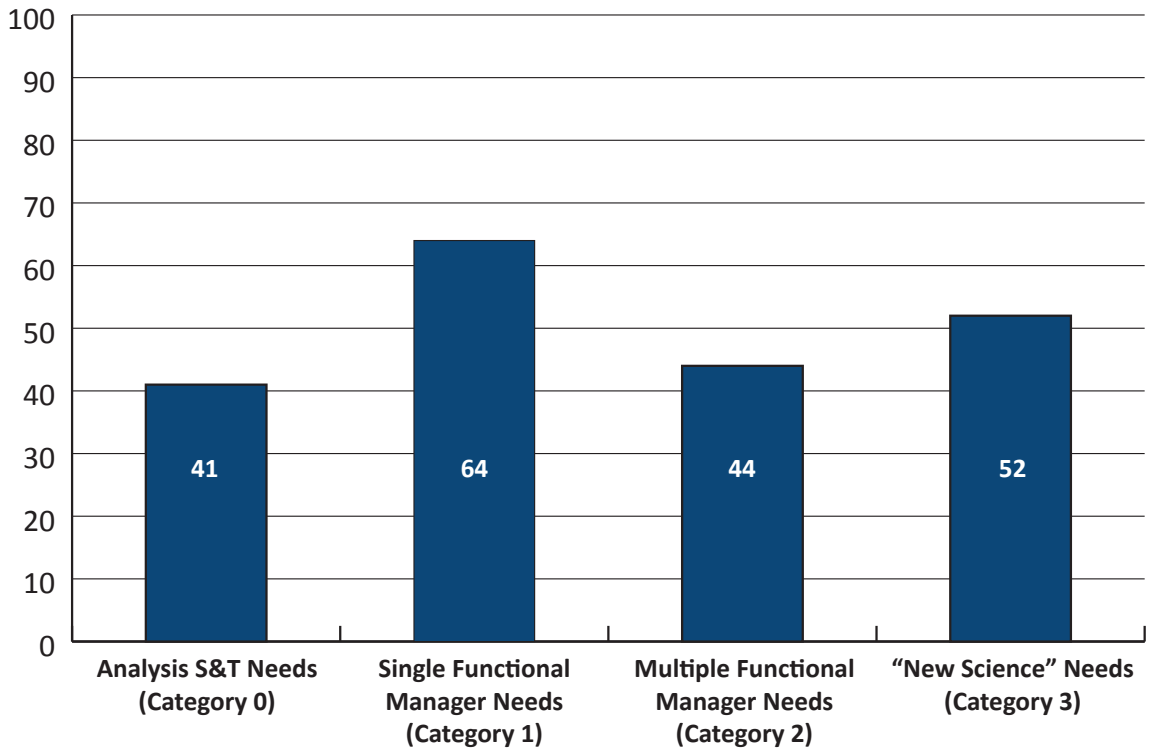


Figure 7.1—Breakdown of aggregated IC-wide S&T-related Needs by category. As the principal driver of IC integration, ODNI and its DS&T will coordinate Category Two activities, champion Category Three activities, and interface with non-IC partners to leverage resources and expertise. The ability to fuse and integrate is key for many Needs—a trend that, in DS&T's judgment, will only grow with time.

The "New Science" (Category Three) Needs remain the focus of DS&T-led initiatives to organize, plan, and execute coordinated efforts integrating the strengths of the IC elements and leveraging the broader U.S. Government and its partners. Additionally, it is hoped that subsequent versions of IC-wide products, such as the UISs, will be prepared with the intent of encouraging interactions with the FMs and the broader IC S&T enterprise. The importance of encouraging these interactions cannot be emphasized enough and ensures that the FM's S&T aggressively pursues solutions to IC-wide Needs, in addition to those of the element.

The Path Forward

This *Landscape* is the foundation of the IC S&T investment strategy outlined in the *FY2016-2020 IC S&T Strategic Plan.*[5] Sharing the *Landscape* with partners and soliciting their feedback—particularly in combination with an IC-wide review of existing and planned S&T investment portfolios—provides IC leadership with a better understanding of where the IC should allocate its scarce S&T resources. The DS&T developed the Intelligence Science and Technology Partnership (In-STeP) to build upon this foundation and provide a process structure to assist and support IC investment decisions.

In-STeP's goal is to communicate IC Needs to our public- and private-sector partners early in the process to improve planning and to provide insight into S&T investments. Industry engagement and collaboration are essential to the success of In-STeP. As shown in Figure 7.2, the release of the *Landscape* to document current and anticipated IC challenges is the first step in this process. An ongoing process to aggregate proprietary solutions allows both for traditional and non-traditional performers to submit their ideas to meet intelligence challenges and a means for US Government personnel to search this updated database. Additional In-STeP outreach activities include periodic meetings at which IC partners have the opportunity to engage the DS&T, the NISTC, and the IC acquisition community about how their efforts may be incorporated into IC-wide capability roadmaps, technology developments and acquisitions, as outlined in the *Strategic Plan*.

5 http://www.dni.gov/files/documents/atf/In-STeP%20-%20Strategic%20Plan.pdf

Figure 7.2—The Intelligence Science and Technology Partnership (In-STeP).

Given the budgetary challenges the IC is likely to face in the coming years, the conditions are now right for the IC to focus on enhancing its utility with policymakers and warfighters using the current or reduced resources. Accordingly, over the next five years, DS&T will serve as the principal champion of creative, collaborative, IC-wide R&D efforts, recognizing the value of bottom-up, grassroots innovation across the Community and beyond. Through the processes established with In-STeP and the *Strategic Plan*, DS&T will also serve as the IC S&T enterprise's primary means for interacting with partners across the U.S. industrial base—including industry, academia, and elsewhere in government—as well as foreign partners.

This page was intentionally left blank.

APPENDICES

Appendix A: IC S&T Investment Request for Information ODNI 14-02

Solicitation Number:

ODNI-RFI-14-02

Notice Type: Special Notice

Synopsis:

Added: February 20, 2014

Abstract

The Office of the Director of National Intelligence (ODNI), Director of Science and Technology (ODNI/DS&T) is committed to ensuring that promising science and technology (S&T) development opportunities and investment portfolios align with intelligence community (IC) capability needs. To support this goal, ODNI has published the *FY2015-2019 IC S&T Investment Landscape*—a document which projects future IC-wide needs and outlines an initial approach to meet these needs. In this RFI, the ODNI requests ideas on emerging technologies and novel approaches to meet these needs. Additionally, comments on the *Landscape* as well as descriptions of approaches and investment strategies for meeting IC needs beyond those listed in the *Landscape* will be considered. These comments, approaches, and concepts will be reviewed, compiled, and made available to the Director of National Intelligence Science and Technology Committee (NISTC)—the ODNI/DS&T-chaired standing body for the coordination and communication of S&T priorities and research and development (R&D) investments across the IC. NISTC members include the principal science advisors of the IC elements.

Background

A critical consideration in crafting the *FY2015-2019 IC S&T Investment Landscape* was to identify and aggregate as many intelligence needs from across the IC as possible. To accomplish this objective, ODNI/DS&T staff sought to identify intelligence needs from a variety of sources with differing perspectives including Subject Matter Experts (SMEs), Program Management, Specialized Customers, and Field End-Users.

Pursuing the technologies needed to achieve success in the IC's mission is a key responsibility of the IC S&T enterprise. Future operators, analysts, and decision makers will face a complex and interconnected web of challenges for which today's technical capabilities may prove inadequate. Accordingly, ODNI/DS&T is particularly interested in obtaining US industry SMEs' views on technologies and approaches that could meet the IC needs outlined in the *FY2015-2019 IC S&T Investment Landscape*.

Scope

This RFI is intended to obtain US industry's views on those technologies and approaches that may address IC needs to guide IC S&T investment opportunities through FY19 and beyond. This RFI allows for sufficient flexibility to capture industry's views in three ways:

1. Descriptions of technologies and projects applicable to the needs listed in the *Landscape* document;
2. Descriptions of technologies and projects that are applicable to the IC S&T mission, but are outside the scope of the needs listed in the *Landscape*;
3. General comments and feedback on the *Landscape* document and its approach to aggregating IC-wide needs.

The *FY2015-2019 IC S&T Investment Landscape* will be made available for review and comment from February 20, 2014 through April 18, 2014 at the following JWICS addresses:

- NRO IC Acquisition Resource Center (ARC) - http://arc.nro.ic.gov/
- NSA IC ARC - https://www.nsaarc.con.nsa/arc/Login

Preparation Instructions to Respondents

ODNI/DS&T solicits respondents to submit ideas related to this topic for use by the Government. ODNI/DS&T requests that submittals briefly and clearly describe the potential approach or concept and its benefits, outline critical technical issues/obstacles, describe how the approach may address those issues/obstacles, and comment on the expected performance and robustness of the proposed approach. If appropriate, respondents may also choose to provide a non-proprietary rough order of magnitude regarding what such approaches might require in terms of funding and other resources for one or more years. This announcement contains all of the information required to submit a response. No additional forms, kits, or other materials are needed.

ODNI/DS&T appreciates responses from all capable and qualified sources from within the US. **Responses from teams with complementary areas of expertise are encouraged.** The required submission method for responding to the needs listed in the *Landscape* document is to identify in an editable Excel table (no macros) the needs (as numbered in the document) that will be most impacted by an existing technology or state-of-the-art-project in your organization. Columns in the table shall be:

1. Need #
2. Company Name
3. Respondent's point(s) of contact (POC(s)) e-mail
4. Technology / Project Name
5. (Portion Mark) Up to 400 word description of the technology/project
6. (Portion Mark) Up to 75 word description of how the technology/project relates to the need
7. Current technology readiness level (TRL) estimate
8. Current sponsor (internal IRAD or external)
9. Estimated rough order of magnitude cost per year for implementation

Supplemental content within this table beyond the information requested above will not be reviewed. Additionally, comments and feedback on the *Landscape* document as well as descriptions of R&D efforts outside of the scope of the needs that are broadly applicable to the IC S&T mission that participating entities would like to highlight will be accepted. These submissions shall have the following formatting requirements:

1. A one-page cover sheet that clearly identifies the title, organization(s), respondent's technical and administrative POCs—including names, addresses, phone and fax numbers, and email addresses of all co-authors—and clearly indicates its association with ODNI-RFI-14-02;
2. A substantive, focused, executive summary (limited to one-half page in minimum 12-point Times New Roman font, appropriate for single-sided, single-spaced 8.5 by 11 inch paper, with 1-inch margins);
3. A description (limited to 1 page in minimum 12-point Times New Roman font, appropriate for single-sided, single-spaced 8.5 by 11 inch paper, with 1-inch margins) of the technical challenges, suggested approach(es), and a statement of how the IC would benefit;
4. A list of citations (any significant claims or reports of success must be accompanied by citations, and reference material MUST be attached);
5. Optionally, a single overview briefing chart graphically depicting the key ideas.

Submission Instructions to Respondents

Responses to this RFI are due no later than 4:00 pm Eastern Daylight Time on April 18, 2014. All submissions must be electronically submitted to *S&TInvestment@dnits.ic.gov* as an Excel-compatible spreadsheet or PDF document. No telephone inquiries will be accepted.

Submissions may include proprietary content, but such content must be clearly marked. Proprietary content is not required.

DISCLAIMERS AND IMPORTANT NOTES

This RFI is issued solely for information and potential planning purposes and does not constitute a solicitation. Respondents are advised that the ODNI is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI.

Responses to this notice are not offers and cannot be accepted by the Government to form a binding contract. Respondents are solely responsible for all expenses associated with responding to this RFI. It is the respondents' responsibility to ensure that the submitted material has been approved for public release by the organization that funded whatever research is referred to in their response.

The Government does not intend to award a contract on the basis of this RFI or to otherwise pay for the information solicited, nor is the Government obligated to issue a solicitation based on responses received. Proprietary concepts and information—should they be included in the submittal—will be protected appropriately. Input on technical aspects of the responses may be solicited by ODNI from non-Government consultants/experts who are bound by appropriate non-disclosure requirements.

Contracting Office Address:

Office of the Director of National Intelligence
Assistant Director for Acquisition, Technology and Facilities
Washington, District of Columbia 20511, United States
Primary Point of Contact: Dr. David M. Isaacson, S&TInvestment@dnits.ic.gov (JWICS)
or S&TInvestment@dni.gov.

This page was intentionally left blank.

Appendix B: Acronyms

Acronym	Definition
ABI	Activity-Based Intelligence
ASAT	Anti-satellite
AVC	Arms Control, Verification and Compliance
BIM	Building Information Model
CAD	Computer-Aided Design
CBRNE	Chemical, Biological, Radiological, Nuclear, and Explosives
CCMD	Combatant Command
CIA	Central Intelligence Agency
CIG	Consolidated Intelligence Guidance
COTS	Commercial-off-the-shelf
DIA	Defense Intelligence Agency
DNA	Deoxyribonucleic Acid
DNI	Director of National Intelligence
DOD/DoD	Department of Defense
DOE	Department of Energy
DOS	Department of State
DS&T	Director of Science and Technology
EM	Electromagnetic
FM	Functional Manager
GEOINT	Geospatial Intelligence
GIS	Geospatial Information System
GMTI	Ground Moving Target Indicator
HDBT	Hard and Deeply Buried Target
HLT	Human Language Technology
HSI	Hyperspectral Intelligence
HUMINT	Human Intelligence
I&W	Indication and Warning
IC	Intelligence Community
ICBM	Intercontinental Ballistic Missile
IED	Improvised Explosive Device
IPL	Integrated Priority List
IPPBE	Intelligence Planning, Programming, Budgeting and Evaluation
IR&D/IRAD	Independent Research and Development
IRTPA	Intelligence Reform and Terrorism Prevention Act of 2004
ISR	Intelligence, Surveillance, and Reconnaissance

Appendix B: Acronyms *(Continued)*

Acronym	Definition
LIDAR	Light Detection and Ranging
MASINT	Measurement and Signature Intelligence
MODSIM	Modeling and Simulation
MSI	Multispectral Intelligence
NGA	National Geospatial-Intelligence Agency
NIM	National Intelligence Manager
NIP	National Intelligence Program
NISTC	Director of National Intelligence Science and Technology Committee
NRO	National Reconnaissance Office
NSA	National Security Agency
ODNI	Office of the Director of National Intelligence
ODNI/DS&T	ODNI Director of Science and Technology
OSINT	Open-source Intelligence
PM	Program Manager
R&D	Research and Development
RADAR	Radio Detection and Ranging
RFI	Request for Information
SAR	Synthetic Aperture RADAR
SIGINT	Signals Intelligence
SME	Subject Matter Expert
S&T	Science and Technology/Scientific & Technological
TT&L	Tagging, Tracking and Locating
UGF	Underground Facility
UIS	Unifying Intelligence Strategy(ies)
WMD	Weapons of Mass Destruction

This page was intentionally left blank.

This page was intentionally left blank.

The Intelligence Science and Technology Partnership

In-STeP

For more information, please contact **S&TInvestment@dni.gov** or visit **www.dni.gov/in-step**

Translate Intelligence Needs into Anticipated Technical Challenges

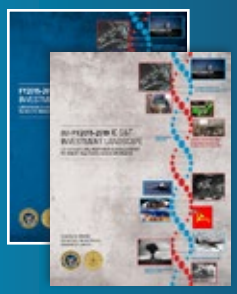
Survey Partners' Funded Efforts to Inform Decisions

Ensure Intelligence Advantage

Key In-STeP documents include:

FY2015-2019 IC S&T Investment Landscape — TS/SCI version

- Projects the science and technology (S&T) Needs of disparate stakeholders — including the National Intelligence Managers, the combatant commands, and other IC customers and specialty groups, and
- Provides an auditable, rational structure within which both industry and IC elements link S&T investments to customer needs



FY2015-2019 IC S&T Investment Landscape — SECRET//REL TO USA, FVEY and UNCLASSIFIED versions

- Further facilitates the sharing of the *Landscape* Needs with the combatant commands, foreign partners, and the non-cleared performer community, and
- Provides a basis for reaching out to innovative performers beyond the traditional IC supplier community

Partner Response to the FY2015-2019 IC S&T Investment Landscape — TS/SCI version

- Provides a high-level matching of public- and private-sector partners' existing, funded programs to the IC-wide Needs captured in the *Landscape*,
- Enables IC developers to achieve unprecedented insight into the commercial solution marketplace, and
- Extensive database of proprietary efforts available to US Government personnel

Industry Snapshot – Summary of Partner Responses to the FY2015-2019 IC S&T Investment Landscape — UNCLASSIFIED version

- Provides a preliminary, non-proprietary market analysis of partner-proposed solutions to the *Landscape* Needs, and
- Offers a resource for industry and US Government-wide S&T planning as well as procurement and acquisition decision-making

FY2016-2020 IC S&T Strategic Plan — TS/SCI and UNCLASSIFIED versions

- Acts as the charter document guiding the IC's S&T activities,
- Advances the IC's ability to manage risk across the National Intelligence Program,
- Incorporates insights from *Landscape* Needs-driven, industry-led S&T roadmap activities, and
- Informs IC elements' acquisition investment decisions

SORD 16288680 160424 | ID 01-16