

NIST Economic Analysis Brief 12

NIST Interactions: Fiscal Year 2015 through Fiscal Year 2018

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September 2020



U.S. Department of Commerce
Wilbur L. Ross, Jr., Secretary

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

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Key Findings

- NIST interacted with domestic institutions more than 354,000 times from fiscal year 2015 through fiscal year 2018.
- NIST participated in 88,717 interactions on average each year throughout the United States.
- NIST connected with 8,492 unique, domestic institutions on average each year.

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1. INTRODUCTION

Each year, the National Institute of Standards and Technology (NIST) interacts with a variety of academic institutions, private businesses, and government entities in the pursuit of its mission to promote U.S. innovation and industrial competitiveness [1]. Information about the number of interactions among NIST and its partners¹ is important in understanding the influence of NIST laboratories, measurements, and services across the United States. Examining the types of interactions, including standards development, grants, awards, research agreements, technical services, education, and purchased products between NIST and its partners can demonstrate the size of NIST's footprint on the U.S. economy.

NIST works directly with private businesses, academic institutions, and government entities in a variety of ways; therefore, there are many avenues through which NIST can impact the U.S. economy. The Technology Partnerships Office (TPO) at NIST previously studied the total number of annual interactions for fiscal years (FY) 2010 through 2014, and the extent to which these interactions are dispersed geographically. This study continues TPO's research on NIST interactions data by summarizing data from FY 2015 through FY 2018.

In this work, we provide an overview of the types and quantities of interactions by NIST. We caveat this overview by stating that individual interactions may vary in their size, scope, and impact. As such, this work is appropriately viewed as a description of the portfolio of activities that NIST engages in. This caveat takes on greater importance when considering interactions of different types of activities, which are less comparable than activities within the same type. As such, we provide information on the counts of interactions but make no claims as to the magnitude of impact or relative merits of the individual interaction types.

2. METHODOLOGY

To analyze NIST's impact on the U.S. economy, we developed a list of mechanisms through which NIST interacts with its partners and customers. We classify these interactions into four categories:

- Education
- Research

¹ The term "partners", in its most broad sense, is used to define all the entities that interact with NIST. This means that a "partner" can be used to reference a business, an academic institution, or a government entity. For some interaction types, a partner will be a customer that purchases a product from NIST. In other cases, a partner may refer to someone that obtained funding, shared research, or obtained education from NIST.

- Sales and
- Services.

Interaction types included into each category are as follows. The education category includes publications and conferences. The research category includes research participants at the Center for Nanoscale Science and Technology (CNST) and the NIST Center for Neutron Research (NCNR), research associates, and Cooperative Research and Development Agreements (CRADAs). The sales category includes customers who purchased products made available for sale, such as Standard Reference Materials (SRM), Standard Reference Data (SRD), Standard Reference Instruments (SRI), calibrations, and patent licenses. The services category includes grants, Small Business Innovation Research Program (SBIR) awards, National Voluntary Accreditation Program (NVLAP) accreditations, Standards Development Organization (SDO) participants, Conformity Assessment Body (CAB) participation, Manufacturing Extension Partnership (MEP) clients, and Baldrige Performance Excellence Program participants. Appendix A provides illustrative examples of example partners and example interactions for each interaction type.

For this study, we analyzed data on eighteen interaction types to describe the various direct relationships NIST has with the U.S. economy.

To retrieve information about the quantity and location of NIST partners, we performed an isolated data request for FY 2015 through FY 2018 for each interaction type. The numbers reported differ slightly from the Department of Commerce's annual technology transfer report [2] because they reflect data collected at a different point in time.

For SRI, NVLAP, SDO, CAB, MEP, and Baldrige metrics, we were unable to obtain complete lists of total interactions and partner address information. Instead, the offices providing the data gave their own totals of the information requested. We total NVLAP data by calendar year, rather than fiscal year. Standards Development Organizations and Conformity Assessment Bodies data are from the most recent fiscal year. We use this data for annual averages because the number of NIST SDO and CAB involvement is very steady over time. We report SRIs, MEP Clients Served, and Baldrige Program participant data as total interactions per fiscal year and total partners per fiscal year.

3. SUMMARY OF DATA

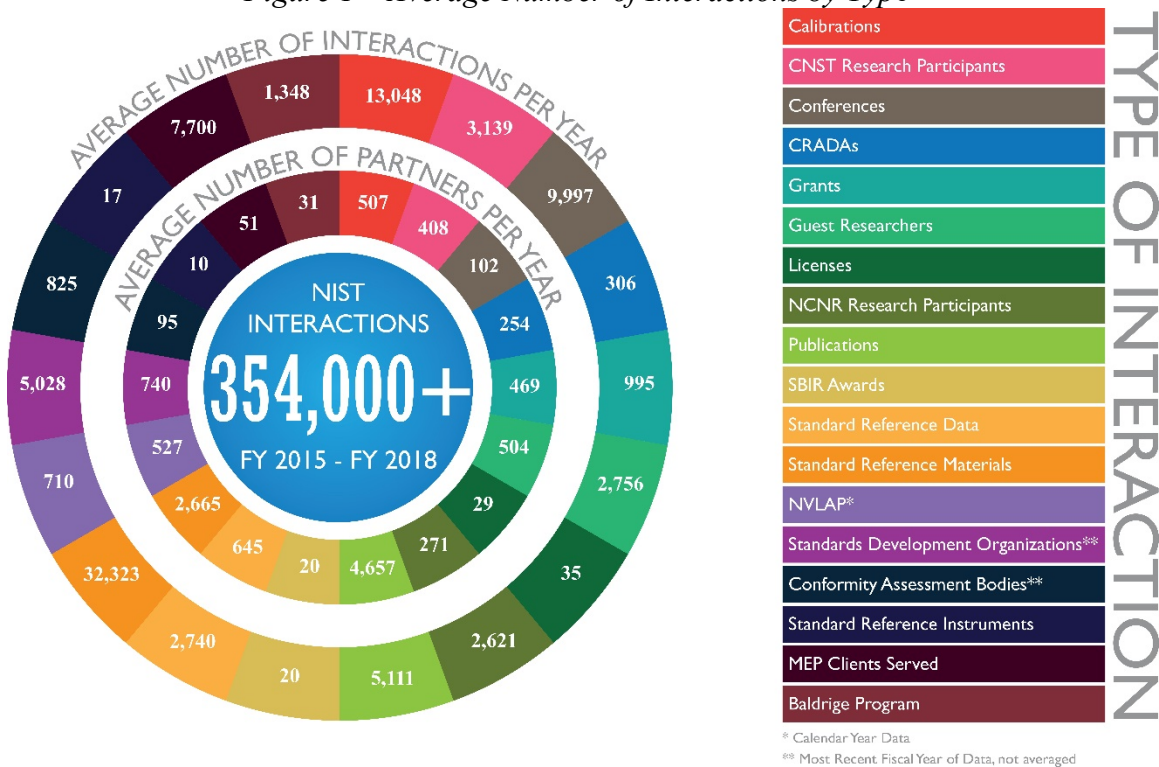
Figure 1 shows the average number of interactions in which NIST engages each year with its partners.² Total interactions of all years in the study exceeds 354,000. For the eighteen interaction types described³, the average number of interactions from FY 2015 through

² Each partner represents a unique entity that NIST has engaged with via that interaction type. Each interaction represents a unique engagement via that interaction type. It is the case that NIST may have multiple interactions with a single partner in an interaction type.

³ An interaction is a unique engagement with a company, organization, or institution.

FY 2018 is 88,717 annually (standard deviation of 1,683.10). For the same four-year period, the average number of individual partners annually is 8,492 (standard deviation of 125.16).

Figure 1 – Average Number of Interactions by Type⁴



From Figure 1 we can observe the individual interactions categories. In the Education category, NIST averaged 5,111 publications with 4,657 partners and 9,997 conference attendees at 102 conferences. In the Research category, NIST averaged 3,139 CNST Research Participants with 408 partners, 2,621 NCNR research participants with 271 partners, 2,756 guest researchers from 504 partners, and 306 CRADAs with 254 partners. In the Sales category, NIST averaged 32,323 SRM sales with 2,665 partners, 2,740 SRD sales with 645 partners, 17 SRI sales with 10 partners, 13,048 calibrations with 507 partners, and 35 patent licenses with 29 partners. In the services category, NIST averaged 995 grants with 469 partners, 20 SBIR awards with 20 partners, 710 NVLAPs with 527 partners, 5,028 SDO memberships with 740 partners, 825 CAB memberships with 95 partners, 7,700 MEP clients served with 51 partners, and 1,348 Baldrige Program participation with 31 partners.

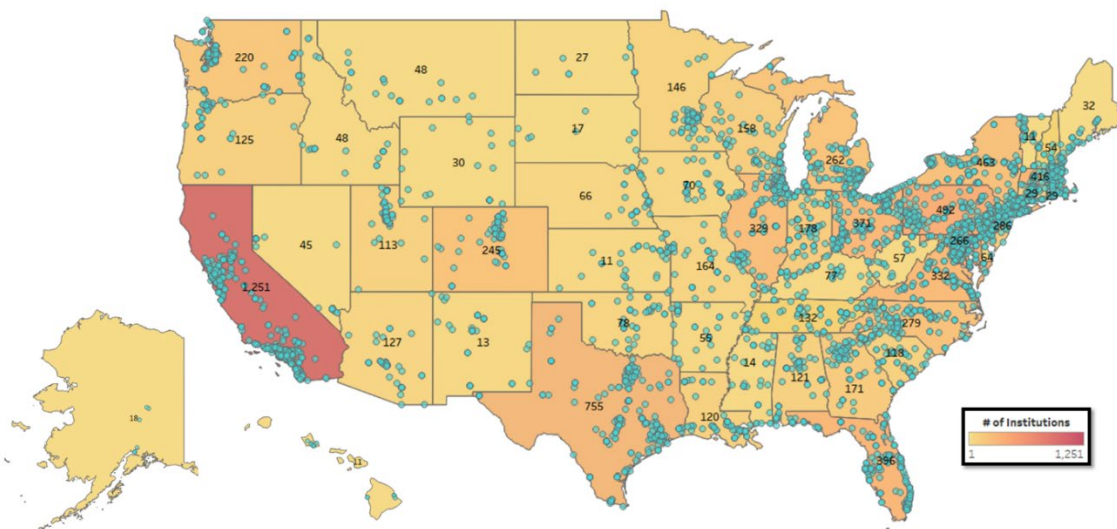
We reiterate that this work describes the portfolio of interactions that NIST has with its external partners and not the impacts of these interactions. Thus, a change in counts of an

⁴ This report updates and supersedes any previously published data related to these metrics.

interaction type does not necessarily indicate change in impact. Further, it is impossible to determine the cause for observed changes in the type of interaction type.

Figure 2 illustrates the location of each NIST partner. This distribution illustrates the wide-spread influence that NIST services have domestically. Interactions are distributed across the United States, from Silicon Valley to the Northeastern Corridor, and everywhere in between. Blue circles on the map indicate the cities where NIST's partners are located. The heat-map color scheme and numbers labeled on each state shows the number of unique partners in each state. These values are not adjusted per capita but provide a measure of the magnitude of NIST's interaction footprint in each state.

Figure 2 – Heat Map of Unique Partners by State (FY 2015 through FY 2018)⁵



The greatest number of NIST partner institutions are in California (1,251) and Texas (755). Pennsylvania, Florida, Ohio, Virginia, Massachusetts, Illinois, and New York also have more than 300 NIST partner institutions.

4. SUMMARY

NIST provides wide-ranging support to the U.S. economy. There are consistently tens of thousands of interactions between NIST and its partners annually. The diversity in the types of the interactions illustrates that NIST is providing a wide range of education, research, products, and services to the U.S. economy.

NIST interacts with partners located in every state. The broad geographic distribution of NIST's interactions show the wide reach of support that NIST provides to the United

⁵ We did not obtain geographic data for: NVLAP, Standards Development Organizations, Conformity Assessment Bodies, Standard Reference Instruments, MEP Clients, and Baldrige Program Participants.

States. This wide reach contributes to NIST's ability to fulfil its mission of promoting U.S. innovation and industrial competitiveness.

While we are unable to quantify the specific economic impact of these interactions, we illustrate the broad range of support and wide-reaching influence on the U.S. economy that NIST provides with its interactions. Future research in this area may consider the external economic impacts or the specific influence in geographical areas of NIST's interactions.

5. REFERENCES

- [1] NIST Mission, Vision, Core Competencies, and Core Values. (2017, January 26). Retrieved October 31, 2017, from <https://www.nist.gov/about-nist/our-organization/mission-vision-values>
- [2] Annual Report on Technology Transfer: Approach and Plans, Fiscal Year 2018 Activities and Achievements. (2019, October). Retrieved from https://www.nist.gov/system/files/documents/2019/10/17/fy2018_doc_tt_final.pdf
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6. APPENDIX A

Table 1 presents the number of partners and interactions for each interaction type and provides an example of a partner and interaction for each interaction type. Each partner represents a unique entity that NIST has engaged with via that interaction type. Each interaction represents a unique engagement via that interaction type. It is the case that NIST may have multiple interactions with a single partner in an interaction type. The examples in Table 1 are not exhaustive but provide an illustrative case to guide the reader's understanding.

Table 1 – NIST Interactions: Annual Averages

		Annual Averages (Standard Deviation shown in parentheses)		Example	
		Partners	Interactions	Partner	Interaction
Calibrations	The total of calibration services, special physical measurement tests, and measurement assurance programs.	507 (23.21)	13,048 (953.67)	A unique company that has requested a calibration	An individual agreement for calibration services
CNST Research Participants	The participants with direct involvement or collaboration in research experiments or projects. This research can be done via on-site or remote access to the facility.	408 (32.91)	3,139 (289.87)	An entity associated with at least one researcher	An individual researcher from a partner entity
Conferences	Although conference attendees often attend on behalf of a business or institution, these affiliations are not consistently reported. Therefore, only conference attendees are counted as individual interactions.	102 (5.97)	9,997 (688.16)	A unique NIST-hosted conference	An individual attendee, regardless of affiliation, at a NIST-hosted conference
CRADAs	The information for CRADAs includes only traditional CRADAs issued by NIST. Other CRADA types, such as Material Transfer Agreements, are not included.	254 (67.15)	306 (92.48)	An individual company who has entered a CRADA with NIST	An individual CRADA agreement

Grants	We retrieved the data for grants from the www.grants.gov website.	469 (40.33)	995 (130.87)	A unique entity that received a grant from NIST	An individual grant
Guest Researchers	The total number of researchers hosted by NIST to collaborate on scientific projects. These include researchers with term appointments and those classified as non-NIST employees.	504 (12.19)	2,756 (50.40)	A unique entity associated with at least one guest researcher	An individual researcher
Licenses	We included all active licenses to generate license data for each fiscal year.	29 (3.96)	35 (4.60)	A unique entity who received a patent license from NIST	An individual license agreement
NCNR Research Participants	The participants with direct involvement or collaboration in NIST research done on-site or remotely.	271 (9.62)	2,621 (139.79)	A unique entity associated with at least one participant	An individual researcher from a partner entity
Publications	Publications data represent the number of unique institutions and/or the number of non-NIST co-authors involved in each publication.	4,657 (145.87)	5,111 (327.44)	A unique entity with which a NIST author published a peer-reviewed paper	A non-NIST co-author on one peer-reviewed published paper
SBIR Awards	We included both phase I and phase II SBIR awards for SBIR data.	20 (0.71)	20 (0.83)	A unique entity that received an SBIR grant	An individual SBIR grant
SRDs	Standard Reference Data includes E-Commerce orders only.	645 (32.02)	2,740 (180.25)	A unique entity that ordered at least one SRD	An individual SRD e-commerce order
SRMs	The total number of standard reference material units sold.	2,665 (157.24)	32,323 (738.93)	A unique entity that purchased at least one SRM	An individual SRM order number
NVLAP	The total number of laboratories participating in the National Voluntary Lab Accreditation Program.	527 (9.25)	710 (5.97)	A unique entity receiving accreditations	An accreditation associated with a specific laboratory within a partner entity
Standards Development Organizations	The number of organizations that NIST scientists participate in with a focus on the development of industry standards.	740 (n/a)	5,028 (n/a)	A unique standards development organization	A NIST researcher's participation in one organization

Conformity Assessment Bodies	The number of NIST researcher participating in organizations that undertake conformity assessment techniques and activities.	95 (n/a)	825 (n/a)	A unique conformity assessment organization	A NIST researcher's participation in one organization
Standard Reference Instruments	The total number of SRIs sold and the number of unique companies that purchased these instruments.	10 (n/a)	17 (n/a)	A unique entity that has purchased at least one SRI	An individual SRI unit sold
MEP Clients	The total number of Manufacturing Extension Partnerships clients that received services at a MEP center.	51 (n/a)	7,700 (n/a)	A unique MEP center	A unique entity that received services at one MEP center
Baldrige Program	The Baldrige Performance Excellence Program numbers as the number of assessed applicant organizations for the Baldrige Award program.	31 (n/a)	1,348 (n/a)	A unique Baldrige program	A unique entity that participated in one program
TOTAL		11,985	88,717		

(n/a) = not available