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Collaboration in the National Cancer Institute Informatics Technologies for Cancer Research Initiative

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July 2018

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IDA Paper P-9200

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About This Publication

This work was conducted by the IDA Science and Technology Policy Institute under under contract NSFOIA0408601, Project NC-20-4482, "Evaluation of the NCI Informatics Technology for Cancer Research (ITCR) Program," for the National Cancer Institute (NCI). The views, opinions, and findings should not be construed as representing the official positions of the National Science Foundation or the sponsoring office.

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Executive Summary

The Informatics Technology for Cancer Research (ITCR) Program is a trans-NCI grant program supporting investigator-initiated informatics technology development driven by critical needs in cancer research. The program was initiated in 2012 and was first renewed in 2015. The program is currently supported through four funding opportunities: small awards for development of innovative methods and algorithms (supported through the Exploratory/ Developmental Research Grant Program or R21 activity code), awards for early-stage development of technologies (supported through the Research Project—Cooperative Agreements or U01 activity code), awards for advanced development of technologies (supported through the Resource-Related Research Projects—Cooperative Agreements or U24 activity code), and awards for sustained support of informatics resources (supported through the U24 activity code). Collaboration is a hallmark of the ITCR program. The program functions as a network, with investigators participating in annual meetings, monthly teleconferences, and working groups; award funds are reserved for collaborative activities, including efforts that integrate tools developed by individual teams. In support of a second renewal request, NCI requires an independent evaluation of the program. As part of this evaluation process, NCI tasked the IDA Science and Technology Policy Institute (STPI) in February 2018 to survey ITCR investigators with respect to collaborations within and among funded awards. Other STPI-supported efforts include: 1) developing case studies of individual ITCR projects, focusing on projects' impact and use by researchers and clinicians; and 2) facilitating an expert panel to provide evaluative feedback regarding ITCR as a whole.

STPI staff developed an Internet-based survey that contained closed-ended and free-text questions in February and March of 2018. The survey was conducted in April and May 2018. A total of 84 surveys were distributed to all contact principal investigators (PIs) and co-PIs, including former PIs for awards where the PI had changed over time. We received 56 unique survey responses representing 67% of investigators. At least one survey was returned for 46 distinct awards, representing 84% of awards. For the purpose of the analysis, STPI team members identified three stratifications of the awards. One stratification surrounded the nature of the activity, as encapsulated by the activity code associated with ITCR awards. A second stratification concerned award status (current versus complete). ITCR network activities have evolved over time, and so STPI staff considered collaboration patterns of the newer awards likely to be different from those of older awards. A final stratification was made based on the nature of the tools being developed by ITCR awards to identify if the nature of the tools themselves were correlated

with variations in collaboration patterns. NCI program staff characterized awards into eight groups, and STPI staff reduced those to three categories: -omics, imaging, and “other” for the purposes of the analysis.

The survey results lead to six summary findings regarding collaboration in the context of ITCR awards.

1. ***ITCR Has Supported the Formation of Core Teams that Tend to Be Multidisciplinary and Multi-institutional.*** Core team members (CTMs) were defined explicitly for survey participants as research staff members/staff scientists fully or partially supported by the core ITCR award. At the award level, among the 41 awards whose contact PIs reported CTMs, 80% (33/41) reported at least one CTM from a different academic department, 59% (24/41) of awards reported at least one CTM from a different institution, and 22% (9/41) reported at least one non-academic CTM. The proportion of contact PIs reporting at least one CTM from a different institution differed by activity code, with fewer R01/R21 ITCR awardees reporting at least one CTM from a different institution, and more U24s identifying CTM groups involving investigators from different institutions.
2. ***The Large Majority of ITCR Awardees Form Additional Collaborations, Including with Members of other ITCR-Supported Teams.*** Almost all survey respondents indicated that they formed new connections with one or more types of collaborators, and the large majority strengthened connections with existing collaborators as a result of their ITCR award. Notably, 87% (46/53) of respondents identified forming or strengthening collaborations with at least one other ITCR investigator. In their qualitative responses, survey respondents described the nature of their collaborations. The most prevalent form of ITCR-ITCR collaboration concerned linking or integrating ITCR-supported tools, followed by collaborating to develop new methods or to add functionality to existing ITCR tools.
3. ***ITCR Administrative Supplements and Set-aside Projects Further Deepen Collaborations, Especially Among Awardees with Cooperative Agreements.*** The ITCR program has used two mechanisms to foster collaborations across awards. In the early years of the initiative, administrative supplements were used to foster collaboration. In the current round of awards, PIs of the cooperative agreements (e.g., U01 and U24 awards) have been directed to reserve 10% of their budgets for collaborative projects. Approximately half of the contact PIs returning surveys reported using these funds to support collaborative activities. There were statistically significant differences by activity code, with U24 awardees being more likely than R01/R21 awardees to report use of funds for these activities. Similarly, more -omics PIs reported the use of such funding than

PIs engaged in informatics technology development in other domains. Free-text responses predominantly mentioned using set-aside/supplementary funding to develop new methods and tools or to link/integrate existing ITCR-supported tools.

4. ***Several ITCR Awardees Make Use of Commercial Subcontracts as Part of their Software Development Process.*** One-sixth of the awardee contact PIs identified that their projects engaged in commercial subcontracts. As would be expected, awardees whose projects were completed were more likely to have engaged in commercial contracting than awardees whose projects were ongoing. Respondents who used sub-award contracts to engage commercial firms in their ITCR projects described those relationships as providing software engineering expertise, whether with respect to developing the user interface and enhancing the user experience, making software more easily installable, providing software support and maintenance, or assisting with training and user support.
5. ***Approximately Half of ITCR Awardees Report Follow-on Activities Leveraging their ITCR Awards.*** Twenty-nine respondents reported that they are PIs or co-PIs on applications for additional awards based on collaborations formed during their ITCR work, whether planned, in preparation, submitted, or awards received. The R01 and R21 awardees were less likely to report follow-on activities than respondents associated with ITCR cooperative agreements, although differences were not statistically significant. Most (55%) of those 29 respondents reported 1 ITCR-based award collaboration, though others reported up to 4.
6. ***ITCR Awardees Report High Levels of Satisfaction with Network Activities.*** Respondents reported high levels of satisfaction with ITCR network activities, such as participating in annual meetings, working groups, monthly PI conference calls, and outreach events coordinated through the program. Respondents also indicated that these activities provided a platform to create new connections with other ITCR researchers or to strengthen existing connections with other ITCR researchers. Of the open-ended responses, most respondents indicated that annual meetings were the most useful in creating these opportunities. A few free-text respondents specifically called out the NCI program staff as being helpful. When asked in an open-ended question about future enhancements to the program, several respondents suggested additional mechanisms aimed at fostering collaborations within the ITCR network or between NCI and other NCI programs (e.g., supplemental funding, a data sharing forum, hackathons). One specific suggestion in this realm was to fund projects to apply ITCR-funded tools to specific challenging cancers. Other

respondents encouraged additional outreach activities, such as special issues in journals and networking sessions at conferences.

Contents

1.	Introduction	1
	A. ITCR Program and Survey Rationale.....	1
	B. Definition of “Collaboration”	2
	C. Survey Timing and Process	2
	D. Organization of the Report	3
2.	Survey Response and Stratifications	5
	A. Overall Response Rate	5
	B. Stratifications.....	5
	1. Response Rate by Activity Code.....	6
	2. Response Rate by Award Status.....	7
	3. Response Rate by the Scientific Character of the Award	7
	C. Implications for Generalizability.....	8
3.	ITCR Award Core Team Membership and Composition.....	9
	A. Number of Core Team Members.....	9
	B. Affiliations of Core Team Members	11
	C. Previous Collaborations Among CTMs	12
4.	Other Collaborations of ITCR Awardees	17
	A. Research Collaborations with non-CTMs	17
	B. Network-Formed Collaborations: Administrative Supplements and Set-Aside Projects	19
	C. Commercial Subcontracts and Startup Firms.....	21
	D. Other Collaborations	22
	E. Follow-on Activities Arising from Collaboration Related to ITCR Awards	23
5.	Satisfaction with ITCR Network Activities	25
6.	Summary Findings.....	29
	A. ITCR Has Supported the Formation of Core Teams that Tend to Be Multidisciplinary and Multi-institutional	29
	B. The Large Majority of ITCR Awardees Form Additional Collaborations, Including with Members of other ITCR-Supported Teams	29
	C. ITCR Administrative Supplements and Set-aside Projects Further Deepen Collaborations, Especially Among Awardees with Cooperative Agreements..	30
	D. Several ITCR Awardees Make Use of Commercial Subcontracts as Part of their Software Development Process	30
	E. Approximately Half of ITCR Awardees Report Follow-on Activities Leveraging their ITCR Awards	30
	F. ITCR Awardees Report High Levels of Satisfaction with Network Activities	31

Appendix A. ITCR Survey Instrument A-1

1. Introduction

A. ITCR Program and Survey Rationale

The Informatics Technology for Cancer Research (ITCR) Program is a trans-NCI grant program supporting investigator-initiated informatics technology development driven by critical needs in cancer research. The program was initiated in 2012 and was first renewed in 2015. The program is currently supported through four funding opportunities:

- PAR-15-334 (R21): Development of Innovative Informatics Methods and Algorithms for Cancer Research and Management
- PAR-15-332 (U01): Early-Stage Development of Informatics Technologies for Cancer Research and Management
- PAR-15-331 (U24): Advanced Development of Informatics Technologies for Cancer Research and Management
- PAR-15-333 (U24): Sustained Support for Informatics Resources for Cancer Research and Management

In support of a second renewal request, NCI requires an independent evaluation of the program. It is anticipated that the renewal request will be submitted in September 2018 to NCI Scientific Program Leadership, and the program evaluation will provide important input for preparing and submitting this request. If approved to renew the program funding opportunity announcements as RFAs, the renewal request will also require approval of the NCI Board of Scientific Advisors (BSA). Although the program is not currently funded through requests for applications (RFAs), the fact that it has been running for several years suggests that an evaluation is appropriate in support of an RFA request to the BSA.

Collaboration is an intentional hallmark of the ITCR program. The program is meant to function as a network, with investigators participating in annual meetings, monthly teleconferences, and working groups; a portion of award funds are reserved for collaborative activities, including efforts that integrate tools developed by individual teams. Therefore, as part of this evaluation process, NCI tasked the IDA Science and Technology Policy Institute (STPI) in February 2018 to survey ITCR investigators with respect to collaborations within and among funded awards. Other STPI-supported efforts include: 1) developing case studies of individual ITCR projects, focusing on projects' impact and use by researchers and clinicians; and 2) facilitating an expert panel to provide evaluative feedback regarding ITCR as a whole.

B. Definition of “Collaboration”

The program’s funding announcements describe collaborative activities that are supported, referring to the annual meeting and working groups, and identifying multi-award projects to enhance the interoperability of ITCR tools.¹ But the program documents do not include a definition of the term, “collaboration” itself. For the purpose of the survey, STPI defined “collaboration” as the social processes whereby human beings pool their capital in pursuit of a shared objective.² Survey respondents were provided the additional guidance that, at a minimum, collaboration requires: (1) sharing information and resources, (2) defined roles in the pursuit of a shared objective, (3) frequent communication, and (4) shared decision making.

C. Survey Timing and Process

STPI staff developed an Internet-based survey in February 2018. The survey was pre-tested by two ITCR awardees in late February and early March for understandability of questions and investigator burden and, after refinements, was launched in March 2018 (survey text in Appendix A). The survey universe consisted of award principal investigators (including co-PIs as well as the contact PI on multiple-PI awards) throughout award lifetimes (i.e., if an award changed PIs, both the old and new PIs received a survey) who had received funding through the nine competitions that had taken place between 2013 and the first half of 2017 (i.e., the May 2017 council review). Investigators received the same survey (provided as a unique link) regardless of whether their awards were active or complete, or whether they were the contact PI or a co-PI on multiple-PI awards. Eighty-four survey links were sent to 80 PIs, as four investigators were PIs on multiple awards.³

Investigators who did not complete the survey after the initial invitation received two follow-up requests by email and a third follow up-request by telephone in April 2018. In May 2018, a final follow-up email was sent to three groups of nonparticipating investigators: (1) investigators whose ITCR awards had completed; (2) investigators who had begun the survey but who had not completed it; and (3) investigators on multiple-

¹ For example, “Collaborative Activities: Awardees are expected to engage in collaborative activities of the ITCR program, including attending annual meetings and participating in working groups. Awardees are also expected to participate in collaborative/joint projects to enhance the interoperability of tools within or beyond ITCR projects. Examples include, but are not limited to: (1) Implementation of common Application Programming Interfaces (APIs) to support data exchange among tools; (2) Adoption of common data standards to support semantic interoperability across resources; and (3) Use of a common software platform/interoperability infrastructure for tool integration” (<https://grants.nih.gov/grants/guide/pa-files/PAR-15-331.html>)

² Definition adapted from Bozeman, B., Fay, D., & Slade, C.P. (2013). “Research collaboration in universities and academic entrepreneurship: the state-of-the-art.” *The Journal of Technology Transfer*, 38(1):1-67.

³ Within the survey universe, a single award had received a competing renewal. Investigators associated with that award received a single survey.

investigator awards who had not completed the survey but whose co-PIs had done so. Survey analysis was conducted during May and June 2018. Because some awards are single-PI and some awards are multiple-PI, analysis considered both the investigator and the award as the unit of analysis, depending upon the nature of the question being addressed. Analysis of closed-ended questions was conducted using R software. Open-ended responses were summarized by a single coder.

Sending surveys to all principal investigators associated with an award created some complexity within the survey analysis. For some questions, it is vitally important to understand each investigator's responses. For example, when assessing perceptions (e.g., strength of network activities) or for identifying facts relevant to an individual's collaborations (e.g., whether collaborations were novel) it is necessary to capture each participant's responses individually, as there may be variation across investigators associated with a particular team. But there are other questions intended to capture factual information about the award as a whole, such as the number of core team members or whether collaborations were formed with industry. For analysis of those questions, a single response per award was required. The contact PI's response was used in these instances.⁴

D. Organization of the Report

Chapter 2 describes the response rate for the survey, stratifications that were employed, and the implications of the survey response for the generalizability of survey findings. Chapter 3 presents findings with respect to award core team size, composition, and collaboration history. Chapter 4 presents findings with respect to collaborations beyond the core award teams, including collaborations with industry, cross-award collaborations, and post-award follow-on research collaborations associated with ITCR-supported projects. Chapter 5 presents findings with respect to the functioning of the ITCR network and network activities. Chapter 6 summarizes survey results and suggests implications for the future.

⁴ Contact PIs were assumed to have the most sophisticated knowledge of award-level details. Responses with respect to collaboration, however, were expected to differ from investigator to investigator within an award (e.g., with respect to whether investigators had worked together pre-award).

2. Survey Response and Stratifications

A. Overall Response Rate

For the purposes of this study, ITCR was determined to be comprised of the 55 awards associated with the 9 application rounds. A total of 84 surveys were distributed to all contact PIs and co-PIs, including former PIs for awards where the PI had changed over time. We received 56 unique survey responses representing 67% of investigators. At least one survey was returned for 46 distinct awards representing 84% of awards. Two surveys were received for 6 awards and 3 surveys were returned for the final 2 awards (Table 1).

Table 1. ITCR Survey Responses

Number of Responses per Award	Number of Awards	Number of Responses Associated with Those Awards
1	38	38
2	6	12
3	2	6
At least one completed survey	46	56
No response provided	9	0
Total unique awards/responses	55	56

Note: Table reports results at award/contact PI level (left side of table) and respondent/surveys sent level (right side of table)

B. Stratifications

Given the nature of the ITCR program, STPI team members identified three stratifications of the awards that might be relevant to the analysis. One stratification surrounded the nature of the activity, as encapsulated by the activity code associated with ITCR awards. Based on STPI's analysis of the program documents, it would be expected that awards would differ based on the funding type. R21 awards are intended for the development of new algorithms and approaches, and the R21 awards are the smallest of the projects in terms of size and duration.⁵ U01 awards are for software initial development

⁵ The R01 awards were grouped with the R21 awards for the purpose of survey stratifications. The R01 awards are similar to the R21 awards with respect to size (as the R01 awards were for competitive revisions) as well as both being grants rather than cooperative agreements; on the other hand, the R21 awards are for algorithm development while the R01 revisions, like the U01 awards, were for software development.

and are larger than R21 awards; because the U01 awards are intended to develop software, they may be more likely to involve industry collaborators than are the R21 awards. U24 awards receive the most funding, and so are likely to have the most complex research teams.

The second stratification concerned award status. ITCR network activities have evolved over time, and so STPI staff considered collaborations among the newer ITCR awards likely to be richer than those of older awards. A countervailing hypothesis, however, was that as new collaborations form over time in the course of research, completed awards may be likely to exhibit more collaborations than ongoing awards. In addition, current investigators were considered more likely to respond to the survey than those not currently funded by NCI. A final stratification was made based on the nature of the tools being developed by ITCR awards to identify whether the nature of the tools was correlated with variations in collaboration patterns. NCI program staff characterized awards into eight groups (Figure 1). STPI reduced those to three categories: -omics, imaging, and “other” for the purposes of the analysis.

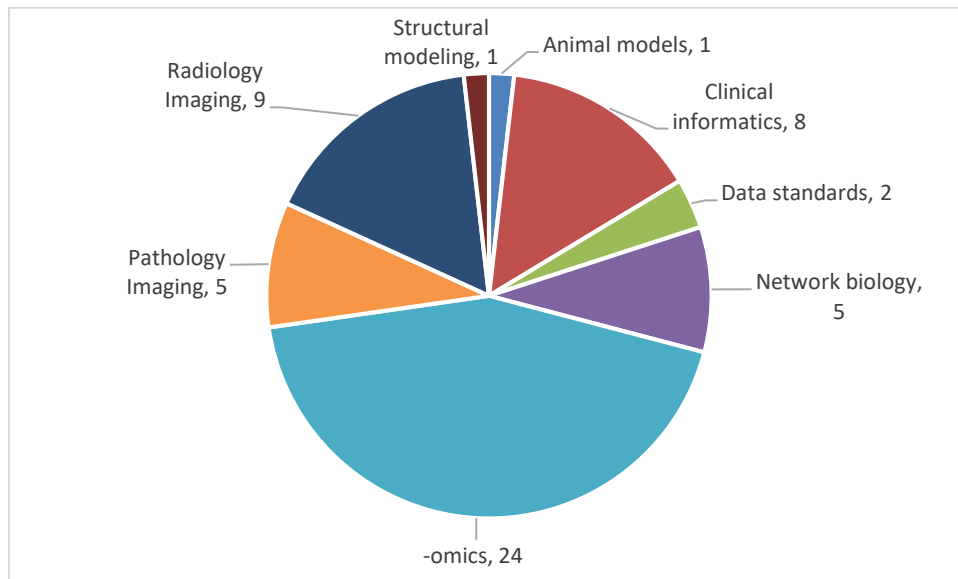


Figure 1. Scientific Characterization of ITCR Awards by NCI Program Staff

1. Response Rate by Activity Code

There were few differences in the response rates across activity codes (Table 2). There were no statistically significant differences in response rate by activity code when either the individual level or the award level was considered.⁶

⁶ Three sample proportion test (award level): $X^2(2, N = 55) = 1.88, p = 0.4$. At the individual level, a generalized linear mixed model (GLMM) with Binomial distribution was used in which activity code was treated as a fixed factor and award number as a random block factor. Analysis of deviance using

Table 2. ITCR Survey Responses by Activity Code

Activity Code	Number of Awards	Number of Awards with at Least One Survey Returned (%)	Number of Surveys Sent	Number of Surveys Completed (%)
R01/R21	8	8 (100%)	11	8 (73%)
U01	17	14 (82%)	22	13 (68%)
U24	30	24 (80%)	51	33 (65%)
Total	55	46 (84%)	84	56 (67%)

Note: Table reports results at award/contact PI level (left side of table) and respondent/surveys sent level (right side of table)

2. Response Rate by Award Status

There were no statistically significant differences in the response rates based on award status at either the individual or the award level (Table 3).⁷

Table 3. ITCR Survey Responses by Award Status

Award Status	Number of Awards	Number of Awards with at Least One Survey Returned (%)	Number of Surveys Sent	Number of Surveys Completed (%)
Active	20	19 (95%)	31	25 (81%)
Completed	35	27 (77%)	53	31 (58%)
Total	55	46 (84%)	84	56 (67%)

Note: Table reports results at award/contact PI level (left side of table) and respondent/surveys sent level (right side of table)

3. Response Rate by the Scientific Character of the Award

There were few differences in the response rates based on the scientific character of the award (Table 4). While the awardees working on informatics related to imaging technologies were least likely to return individual surveys, at an award level those differences were no longer evident. There were not statistically significant differences in response rate by scientific area when either the individual level or the award level was considered.⁸

type-II Wald Chi-square test indicated that activity code was not a significant factor ($X^2 (2, N = 84) = 0.29, p = 0.9$).

⁷ Two sample proportion test (award level): $X^2 (1, N = 55) = 1.80, p = 0.2$; two sample proportion test (individual level): $X^2 (1, N = 84) = 3.38, p = 0.07$

⁸ Three sample proportion test (award level): $X^2 (2, N = 55) = 0.32, p = 0.9$; three sample proportion test (individual level): $X^2 (2, N = 84) = 0.30, p = 0.9$.

Table 4. ITCR Survey Responses by Scientific Character of Awards

Classification of Scientific Character of Award	Number of Awards	Number of Awards with at Least One Survey Returned (%)	Number of Surveys Sent	Number of Surveys Completed (%)
-omics	24	20 (83%)	33	23 (70%)
Imaging	15	12 (80%)	27	17 (63%)
Other	16	14 (88%)	24	16 (67%)
Total	55	46 (84%)	84	56 (67%)

Note: Table reports results at award/contact PI level (left side of table) and respondent/surveys sent level (right side of table)

C. Implications for Generalizability

With more than 80% of awards associated with at least one returned survey, STPI considers the response rate to be acceptable for drawing inferences regarding the program as a whole. While the response rate is stronger for active awards than completed awards at both award and investigator level, the differences are not statistically significant, and so survey findings should be taken as generalizable across subgroups of awards.

3. ITCR Award Core Team Membership and Composition

This section of the survey analysis focuses on collaborations embodied in the core teams of ITCR awardees. We consider the size of teams, as measured by the number of CTMs, the affiliations of the CTMs, and the existence of previous collaborations between survey respondents and CTMs.

A. Number of Core Team Members

Respondents were asked to name their CTMs, with a maximum of six responses allowed.⁹ “Core team members” were defined explicitly for survey participants as research staff members or staff scientists fully or partially supported by the core ITCR award. In naming these team members, respondents were instructed to include co-PIs named on their ITCR award applications, research staff members or staff scientists supported by the core ITCR award but not formally named on their applications, and other professional research collaborators such as clinicians. Undergraduates, graduate students, postdoctoral fellows, individuals serving as points of contact with commercial firms subcontracted through sub-awards, individuals supported solely by supplements to the ITCR award, and individuals supported solely by annual ITCR budget set aside funding were all excluded from the core ITCR team member construct (questions directed at the latter three groups were addressed separately later in the survey).

Responses were tabulated at the award level, with 5 of the 46 award-level responses reporting no CTMs (Table 5). A total of 171 CTMs were identified based on the contact PIs’ responses¹⁰; respondents identified a median of four team members (mean: 3.7, standard deviation 2.0). The distribution of CTMs by award was complex—the mode was 6 CTMs, with subsidiary peaks at 4 and 2 CTMs per award.

⁹ It is possible that some complex awards have more than 6 CTMs, in which case our data under-weight the CTMs associated with these awards. It was assumed that the contact PIs would have the best information as to which collaborators should be considered “CTMs” for the purpose of the survey, but that assumption may not be true in all cases.

¹⁰ The 171 refers to the number of CTM-award pairs rather than the unique number of individuals named as CTMs; it is possible for a single individual to be named as a CTM on multiple awards.

Table 5. CTM Frequency

Number of CTMs	Number of Responses
0	5
1	1
2	8
3	5
4	9
5	5
6	13
Total	46

Note: Table reports results at award/contact PI level

Stratifying the number of CTMs among our three categories shows that there are some differences across stratifications (Table 6). As would be expected given the size of awards, the U24 awardees had larger core teams than did the R01/R21 and U01 respondents, and the difference was statistically significant. There were some differences in team size based upon the scientific character of the awards, with the “other” category having the largest teams, followed by imaging teams, then by –omics teams. The difference was statistically significant, though the reason for that difference was not intuitively obvious. There was little difference in the size of core teams between current and complete awards.¹¹

Table 6: CTM Frequency by Stratification

		Median	Mean	Standard Deviation	Min/Max
Total		4.0	3.7	2.0	0/6
Activity Code	R01/R21	3.0	2.8	1.4	0/4
	U01	2.5	2.7	2.2	0/6
	U24	5.0	4.6	1.6	1/6
Award Status	Current	4.0	3.8	1.7	1/6
	Complete	4.0	3.7	2.2	0/6
	-omics	3.0	3.0	1.9	0/6

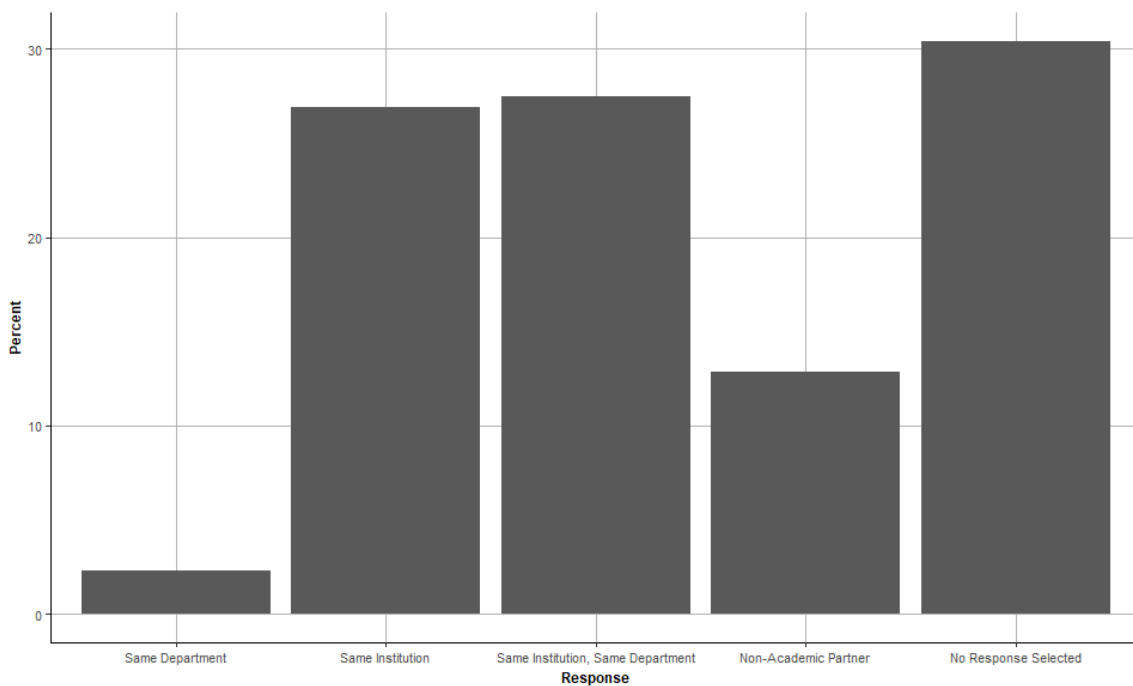
¹¹ Statistical test: Analysis of deviance (Type II test) using GLM with a Poisson distribution. Activity code and research type are significant at $p < 0.001$ and $p = 0.02$ respectively; award status not significant at $p = 0.62$.

		Median	Mean	Standard Deviation	Min/Max
Research Type	Imaging	4.0	4.0	1.9	0/6
	Other	5.5	4.5	2.0	0/6

Note: Table reports results at award/contact PI level

B. Affiliations of Core Team Members

Among the 171 ITCR core team members named, 47 (27%) originated from the same department within the same institution as the respondent who named them, 46 (27%) originated from the same institution but a different department, 4 (2%) were identified as belonging to the same department (but not the same institution), 22 (13%) were identified as non-academic partners, and the remaining 52 (30%) fit none of the categories, suggesting that they were academic collaborators at other institutions and in different departments (Figure 2).



Note: Figure reports results at core team member level

Figure 2. Affiliations of Core Team Members

At the award level, among the 41 awards whose contact PIs reported CTMs, 59% (24/41) of awards reported at least one CTM from a different institution, 80% (33/41) reported at least one CTM from a different academic department, and 22% (9/41) reported at least one non-academic CTM. There were differences identified across several of the stratifications though the sample size limited our ability to detect statistically significant

differences (Table 7). The proportion of contact PIs reporting at least one CTM from a different institution differed by activity code, and the difference was statistically significant.¹² Fewer R01/R21 ITCR awardees reported at least one CTM from a different institution, while more U24s identified CTM groups involving investigators from different institutions.

Table 7: Stratification of CTM Affiliations

		At least one non academic partner	At least one CTM from a diff institution	At least one CTM from a diff department
Total		9/41 (22%)	24/41 (59%)	33/41 (80%)
Activity Code	R01/R21	0/7 (0%)	2/7 (29%)	6/7 (86%)
	U01	2/10 (20%)	4/10 (40%)	7/10 (70%)
	U24	7/24 (29%)	18/24 (75%)	20/24 (83%)
Award Status	Current	3/19 (16%)	8/19 (42%)	16/19 (84%)
	Complete	6/22 (27%)	16/22 (73%)	17/22 (77%)
Research Type	-omics	1/17 (6%)	8/17 (47%)	12/17 (71%)
	Imaging	4/11 (36%)	8/11 (73%)	9/11 (82%)
	Other	4/13 (31%)	8/13 (62%)	12/13 (92%)

Note: Table reports results at award/contact PI level. Five contact PIs reported no other CTMs

C. Previous Collaborations Among CTMs

After naming ITCR core team members, survey respondents were asked questions designed to elicit information on the formation of those collaborations. No response regarding previous collaborations was provided for four CTMs. Among the 167 remaining CTMs, 112 (67%) had established relationships or formal collaborations with the survey respondent prior to the ITCR award (Table 8). In the case of 31 CTMs (19%), the respondent had heard of the individual or his or her work prior to the ITCR award. In only 24 cases (14%) was the respondent unaware of the collaborator prior to the ITCR application.

¹² Three sample proportion test: $X^2(2, N = 41) = 6.69, p = 0.04$

Table 8: Description of Prior Collaboration Between Survey Respondents and CTMs

Description of Prior Collaboration Level	Number of CTMs
Collaboration on previous projects	99 (59%)
Established relationship but no formal collaboration	13 (8%)
Respondent aware of individual but no established relationship	31 (19%)
Respondent unaware of individual	24 (14%)
Total	167

Note: Table reports results at core team member level. No response received for 4 CTMs

Respondents who indicated that they established a relationship with one or more core ITCR team member(s) (i.e., indicated that they were unaware of the individual, or were aware of the individual but had no established relationship) were asked to provide some additional information on how they came to collaborate with those individuals. To the extent to which survey respondents provided information, the most prevalent methods of initiating collaborations were as direct award hires (e.g., research associates or software developers who were considered to be core team members) or through introductions by a colleague. Other responses included through outreach to collaborating institutions, email exchanges, and meeting individuals at conferences.

The genesis of collaborations between survey respondents and CTMs was stratified by activity code, award status, and nature of the technology (Table 9). The only statistically significant difference lay in the nature of the technology, whereby the –omics awardees were less likely than “other” awardees to report new collaborations (i.e., indicated that they were unaware of the individual, aware of the individual but had no prior relationship, or were aware of the individual but had never formally collaborated with him or her).¹³

¹³ Three sample proportion test indicated that new collaborations differed by research type ($X^2(2, N = 167) = 8.31, p = 0.02$). Two sample proportion tests showed that a smaller proportion of -omics awardees reported new collaborations as compared to “other” awardees ($X^2(1, N = 119) = 7.21, p = 0.01$) but not as compared to imaging awardees ($X^2(1, N = 108) = 1.05, p = 0.3$).

Table 9: Stratification of Prior Collaboration Between Survey Respondents and CTMs

		Collaboration on Previous Projects	Established relationship but no formal collaboration	Respondent aware of individual but no established relationship	Respondent unaware of individual
Total		99/167 (59%)	13/167 (8%)	31/167 (19%)	24/167 (14%)
Activity Code	R01/R21	14/22 (64%)	2/22 (9%)	5/22 (23%)	1/22 (5%)
	U01	25/36 (69%)	4/36 (11%)	4/36 (11%)	3/36 (8%)
	U24	60/109 (55%)	7/109 (6%)	22/109 (20%)	20/109 (18%)
Award Status	Current	46/72 (64%)	3/72 (4%)	13/72 (18%)	10/72 (14%)
	Complete	53/95 (56%)	10/95 (11%)	18/95 (19%)	14/95 (15%)
Research Type	-omics	43/60 (72%)	4/60 (7%)	4/60 (7%)	9/60 (15%)
	Imaging	29/48 (60%)	5/48 (10%)	11/48 (23%)	3/48 (6%)
	Other	27/59 (46%)	4/59 (7%)	16/59 (27%)	12/59 (20%)

Note: Table reports results at core team member level. No response received for 4 CTMs

The data were also summarized at the award level. Two-thirds (27/41) of the awards for which contact PIs reported CTMs identified at least one CTM with whom the contact PI had not previously collaborated. Stratifying these results by activity code shows that R01/R21 awardees were most likely to form at least one new collaboration, while stratifying by the nature of the technology identifies once again that –omics awardees were least likely to form new collaborations.

Analyses by the three stratifications were also conducted. When stratified by activity code with respect to at least one new collaboration, R01/R21 PIs were most likely to form new collaborations: 6/7 (86%) R21/R01s, 5/10 (50%) U01s, and 16/24 (67%) U24s. There were few differences reported with respect to award status: 12/19 (63%) current awards and 15/22 (68%) former awards. But there was some difference with respect to field of research, where the –omics awards were least likely to be associated with at least one new collaboration: 8/17 (47%) -omics awards, 8/11 (73%) imaging awards, and 11/13 (85%) other awards. The finding regarding activity codes is counterintuitive, as there is not a statistically significant difference at the CTM level and R01s/R21s report fewer CTMs than do the U01s and U24s (so by random chance R01s/R21s should be less likely to identify at least one new collaboration than the larger U01 and U24 teams).

The finding that collaborations are not randomly distributed was confirmed by cross-tabulating award-level responses identifying at least one new collaboration against the number of CTMs named (Table 10).¹⁴ Together, these findings suggest that the nature of the activities carried out by R01/R21 awardees as distinct from the activities of U01 and U24 awardees may explain part of the difference.

Table 10. Stratification of the Number of Responses with at Least one New CTM Collaboration by the Number of CTMs Reported

Number of CTMs	Number of Responses	Number of Responses with at Least one New Collaboration
0	5	0 (0%)
1	1	0 (0%)
2	8	2 (25%)
3	5	3 (60%)
4	9	7 (78%)
5	5	3 (60%)
6	13	12 (92%)
Total	46	27

Note: Table reports results at award/contact PI level.

¹⁴ The number of CTMs and the number of responses with at least one new collaboration were strongly correlated ($r(5) = 0.89, p = 0.01$).

4. Other Collaborations of ITCR Awardees

In this section of the survey analysis, we consider a range of other collaborations of ITCR awardees, including research collaborations with non-CTMs, industry involvement in the ITCR awards, participation in set-aside projects, and funded projects that involve collaborations building upon ITCR awards.

A. Research Collaborations with non-CTMs

Survey respondents also reported forming or strengthening collaborations with individuals outside of their CTMs as a result of their ITCR awards. *External collaborators* were defined as individuals or groups of individuals with whom the respondent substantively interacted in a capacity related to core ITCR work (excluding work conducted under supplements and set-aside funding, which were handled separately) but who were not directly supported by the ITCR award. Among those respondents reporting on the relevant questions, 98% (53/54) indicated that they formed new connections with one or more types of collaborators, and 87% (46/53) indicated that they strengthened connections with existing collaborators as a result of their ITCR award (Table 11). Notably, 87% (46/53) of respondents identified forming or strengthening collaborations with at least one other ITCR investigator.

Table 11. Survey Respondents' Identification of Forming "External" Collaborations

Item (Number of responses)	Response		
	Yes	No	I don't recall
Formed new collaborations with other ITCR investigators (n = 53)	43 (81%)	10 (19%)	0 (0%)
Strengthened existing collaborations with other ITCR investigators (n = 49)	26 (53%)	19 (39%)	4 (8%)
Formed new collaborations with other investigators (n = 52)	41 (79%)	10 (19%)	1 (2%)
Strengthened existing collaborations with other investigators (n = 52)	42 (81%)	9 (17%)	1 (2%)
Formed new collaborations with companies/NGOs (n = 49)	16 (33%)	32 (65%)	1 (2%)
Strengthened existing collaborations with companies/NGOs (n = 47)	12 (26%)	33 (70%)	2 (4%)

Note: Table reports results at respondent/survey level. Not all respondents answered each question.

In their qualitative responses, survey respondents described the nature of their collaborations. Forty-six survey respondents provided qualitative input regarding their new or expanded collaborations with *ITCR investigators*; the nature of the collaboration could be coded for 36 of the 46 responses. The most prevalent form of collaboration (23 responses) concerned linking or integrating ITCR-supported tools. Other types of collaboration identified included collaborating to develop new methods or to add functionality to existing ITCR tools (13 responses), to have the collaborator adopt an ITCR-supported tool without attempting to integrate it into existing tools (6 responses), and to conduct collaborative research in cancer biology or oncology (5 responses).

Forty-five of the survey respondents addressed collaborations with *other academic investigators*, of which STPI researchers coded the nature of the collaboration for 35. The most prevalent form of collaboration (19 responses) concerned collaborating to develop new methods or to add functionality to existing ITCR tools, followed by to conduct collaborative research in cancer biology or oncology (12 responses).

Twenty survey respondents described collaborations with *industry or NGOs*, of which STPI researchers could code 16. There was not a predominant method of collaboration identified, though common responses were collaborating to develop new methods or to add functionality to existing ITCR tools (5 responses), to conduct collaborative research in cancer biology or oncology (5 responses), or to adapt ITCR-supported tools for other research uses, including for non-cancer research uses (4 responses).

Stratifications identified several statistically significant differences in the closed ended responses, which were analyzed at the individual respondent level (Table 12). Completed awardees were more likely to form collaborations with companies or NGOs than ongoing awardees (whether forming new collaborations or strengthening existing ones).¹⁵ Although the qualitative responses did not provide relevant insight, one potential explanation is that industry collaborations around software maintenance or long-term sustainment may form closer to the end of an award, so the comparison between completed and active awards may reflect differences in the time course of the award rather than an underlying difference in the character of awards made under the most recent program announcements as compared with earlier program announcements. Imaging awardees were most likely to report industry collaborations—either new or strengthened.¹⁶ Although the qualitative responses did not provide relevant insight, one potential explanation is that these ITCR awardees need to work with the companies that develop the scanners that collect the

¹⁵ Two sample proportion test: $X^2(1, N = 49) = 5.09, p = 0.02$

¹⁶ A three sample proportion test indicated that the number of respondents reporting new collaborations with companies/NGOs differed by research type ($X^2(2, N = 49) = 7.10, p = 0.03$). Two sample proportion tests showed that a smaller proportion of -omics awardees reported new collaborations with companies/NGOs as compared to imaging awardees ($X^2(1, N = 35) = 5.31, p = 0.02$) but not as compared to “other” awardees ($X^2(1, N = 35) = 1.14, p = 0.3$).

imaging data, while –omics and “other” PIs are more likely to work with tools developed by academic investigators to collect their data and conduct their analyses.

Table 12. Stratifications of Survey Respondents’ Identification of Forming “External” Collaborations

	Other ITCR Investigators: New	Other ITCR Investigators: Strengthened	Other Investigators: New	Other Investigators: Strengthened	Companies/ NGOs: New	Companies/ NGOs: Strengthened
	43/53 (81%)	26/49 (53%)	41/52 (79%)	42/52 (81%)	16/49 (33%)	12/47 (26%)
R01/R21	4/7 (57%)	2/7 (29%)	4/7 (57%)	6/8 (75%)	0/7 (0%)	0/7 (0%)
U01	11/14 (79%)	6/14 (43%)	13/15 (87%)	12/15 (80%)	4/15 (27%)	2/14 (14%)
U24	28/32 (88%)	18/28 (64%)	24/30 (80%)	24/29 (83%)	12/27 (44%)	10/26 (38%)
Current	19/24 (79%)	10/22 (45%)	16/24 (67%)	18/24 (75%)	3/22 (14%)	4/22 (18%)
Complete	24/29 (83%)	16/27 (59%)	25/28 (89%)	24/28 (86%)	13/27 (48%)	8/25 (32%)
-omics	18/21 (86%)	9/19 (47%)	17/22 (77%)	17/22 (77%)	3/21 (14%)	3/19 (16%)
Imaging	13/16 (81%)	11/15 (73%)	13/15 (87%)	14/16 (88%)	8/14 (57%)	6/14 (43%)
Other	12/16 (75%)	6/15 (40%)	11/15 (73%)	11/14 (79%)	5/14 (36%)	3/14 (21%)

Note: Table reports results at respondent/survey level. Not all respondents answered each question.

B. Network-Formed Collaborations: Administrative Supplements and Set-Aside Projects

The ITCR program has used two mechanisms to foster collaborations across awards. In the early years of the initiative, administrative supplements were used to foster collaboration. In the current round of awards, PIs of the cooperative agreements (e.g., U01 and U24 awards) have been directed to reserve 10% of their budgets for collaborative projects.¹⁷ Approximately half of the contact PIs returning surveys report using these funds to support collaborative activities (Table 13). As would be expected, there were statistically significant differences by activity code, with U24 awardees being more likely than R01/R21 awardees to report their usage.¹⁸ Similarly, more -omics PIs reported the use of

¹⁷ “Collaborative Activities: Applicants must set aside 10 percent of their annual budget (Direct Costs) to support collaborative or joint activities within or beyond ITCR projects, initiated post-award. The amount should be presented in the Other Expenses category under the heading “Collaborative Funds” (<https://grants.nih.gov/grants/guide/pa-files/PAR-15-333.html>)

¹⁸ Three sample proportion test indicated that use of annual set-aside funding or supplementary funding differed by activity code ($X^2(2, N = 46) = 10.5, p = 0.01$). Two sample proportion tests showed that a smaller proportion of R01/R21s awardees reported using annual set-aside funding or supplementary funding as compared to U24 awardees ($X^2(1, N = 32) = 7.30, p = 0.01$) but not as compared to U01 awardees ($X^2(1, N = 22) = 0.99, p = 0.3$).

such funding than PIs engaged in informatics technology development in other domains.¹⁹ The breakdown between current and completed awards reflects the difference in program structure.

Table 13. Stratifications of Survey Respondents' Identification of Participation in ITCR Set-aside Funding and Supplementary Funding Activities

		Annual set aside funding	Supplementary funding	Annual set-aside funding or supplementary funding
Total		12/46 (26%)	16/46 (35%)	25/46 (54%)
Activity Code	R01/R21	1/8 (12%)	0/8 (0%)	1/8 (13%)
	U01	3/14 (21%)	4/14 (29%)	6/14 (43%)
	U24	8/24 (67%)	12/24 (50%)	18/24 (75%)
Award Status	Current	11/19 (58%)	2/19 (11%)	11/19 (58%)
	Complete	1/27 (4%)	14/27 (52%)	14/27 (52%)
Research Type	-omics	8/20 (40%)	8/20 (40%)	15/20 (75%)
	Imaging	1/12 (8%)	4/12 (33%)	4/12 (33%)
	Other	3/14 (21%)	4/14 (29%)	6/14 (43%)

Note: Table reports results at award/contact PI level.

Investigators who participated in set-aside projects were asked individually whether they formed or strengthened collaborations based on the administrative supplements and set-aside projects (Table 14). Among those reporting use of annual budget set-aside funding or supplementary funding, 77% indicated that they formed new connections with one or more types of collaborators, and 83% indicated that they strengthened connections with existing collaborators as a result of activities related their set-aside funding or supplements. As would be expected, collaborations with ITCR investigators were reported most commonly with other investigators (79% reporting new collaborations and 58% reporting enhancing existing collaborations) while collaborations with industry and NGOs were reported rarely. Given the small number of survey responses (n = 24) further stratifications were not reported.

¹⁹ Three sample proportion test indicated that use of annual set-aside funding or supplementary funding differed by research type ($X^2(2, N = 46) = 6.32, p = 0.04$).

Table 14. Stratifications of Survey Respondents' Identification of Participation in ITCR Set-aside Funding and Supplementary Funding Activities

	Other ITCR Investigators: New	Other ITCR Investigators: Strengthened	Other Investigators: New	Other Investigators: Strengthened	Companies/ NGOs: New	Companies/ NGOs: Strengthened
Total	19/24 (79%)	14/24 (58%)	8/24 (33%)	11/24 (46%)	0/24 (0%)	2/24 (8%)

Note: Table reports results at respondent/individual level from among the 24 investigators who indicated that they participated in set-aside or supplementary projects.

When asked to describe new or strengthened collaborations arising from set-aside funds and administrative supplements, 17 survey respondents provided qualitative descriptions of activities, all of which STPI coded. Almost all of the respondents either mentioned using set-aside/supplementary funding to develop new methods and tools (8 responses) or to link/integrate existing ITCR-supported tools (7 responses)—with one response coded in both categories.

C. Commercial Subcontracts and Startup Firms

ITCR participants were also asked about whether their awards engaged in subcontracts with commercial firms or whether startup companies (or NGOs) were launched based on the results of ITCR research to advance the tools and software developed. One-sixth of the awardee contact PIs identified that their projects engaged in commercial subcontracts, and four contact PIs identified that startup companies or NGOs have been formed to advance further the technologies developed through the program (Table 15). As would be expected, U24 awardees were most likely to engage in commercial contracting or startup formation, while R01 and R21 awardees did not report engaging in these activities. Imaging awardees were most likely to engage in commercial subcontracts. The only statistically significant difference, however, is that completed awards were more likely than active awardees to report commercial subcontracting, which again may reflect differences associated with the award life-cycle.²⁰

²⁰ Two sample proportion test: $X^2(1, N = 46) = 4.91, p = 0.03$.

Table 15. Stratifications of Survey Respondents' Identification of Commercial Subcontracts and Startups

		Used Commercial Firm	Established Startup or Non-profit
Total		8/46 (17%)	4/46 (9%)
Activity Code	R01/R21	0/8 (0%)	0/8 (0%)
	U01	1/14 (7%)	1/14 (7%)
	U24	7/24 (29%)	3/24 (12%)
Award Status	Current	0/19 (0%)	0/19 (0%)
	Complete	8/27 (30%)	4/27 (15%)
Research Type	-omics	3/20 (15%)	1/20 (5%)
	Imaging	4/12(33%)	1/12 (8%)
	Other	1/14 (7%)	2/14 (14%)

Note: Table reports results at award/contact PI level.

Respondents who used sub-award contracts to engage commercial firms in their ITCR projects described those relationships as providing software engineering expertise, whether with respect to developing the user interface and enhancing the user experience, making software more easily installable, providing software support and maintenance, and assisting with training and user support. In the words of one survey respondent, “Our contractor (NAME REDACTED) has the software engineering expertise to make our products installable, maintainable, documented, and functional for external users. The PIs and members of their lab develop software prototypes but these are difficult for external users to work with, so (NAME REDACTED) fills this gap for us.” As noted above, four survey respondents indicated that they formed startups or nonprofits associated with their ITCR awards. In describing those companies, three respondents identified starting software firms to commercialize ITCR-supported technologies. To the extent to which they described the firms’ rationale and business models, their intent has been to develop commercial versions of the open-source software supported through ITCR, for industry use—while continuing to support the open-source version for researchers’ use. One respondent described a company formed for the purpose of drug development, where ITCR-supported software would be used as part of their research process.

D. Other Collaborations

When asked whether they engaged in collaborative activities associated with their ITCR awards in any other ways, 21 (38%) of the 56 respondents indicated that they had.

Most of the 21 comments received recapitulated points made in response to earlier free-response questions. Notable responses were:

- ITCR award raised the profile of informatics research within the mission of the Cancer Center
- ITCR award has been instrumental in enhancing the biomedical imaging training efforts at the respondent's institution
- ITCR award helped to facilitate multi-institutional collaborations related to precision oncology
- ITCR efforts to advance clinical data sharing for cohort identification have contributed to research sponsored by the Centers for Disease Control and Prevention, the Patient-Centered Outcomes Research Institute, and through the institution's Clinical and Translational Science Award.

E. Follow-on Activities Arising from Collaboration Related to ITCR Awards

Finally, a number of awardees reported applying for additional awards based on collaborations formed during their ITCR work (termed *ITCR-based award collaborations*). Twenty-nine of 55 (53%) respondents answering the relevant question reported that they are PIs or co-PIs on ITCR-based award collaborations, whether planned, in preparation, submitted, or awards received (Table 16). There were no statistically significant differences ($p>0.05$ for activity code, award status, and research type).

Table 16. Stratifications of Survey Respondents' Identification of Follow-on Activities from ITCR Awards

		ITCR-Based Award Collaboration
Total		29/55 (53%)
Activity Code	R01/R21	2/8 (25%)
	U01	10/15 (67%)
	U24	17/32 (53%)
Award Status	Current	13/24 (54%)
	Complete	16/31 (52%)
Research Type	-omics	11/22 (50%)
	Imaging	9/17 (53%)
	Other	9/16 (56%)

Note: Table reports results at respondent/individual level.

Most (16/29, 55%) of those respondents reported one ITCR-based award collaboration, though others reported up to four (Table 17). More than half of the respondents reporting ITCR-based award collaborations indicated that those collaborations involved CTMs (17/29, 59%), other ITCR investigators (18/29, 62%), and other (non-ITCR) investigators (18/29, 62%). Fewer reported ITCR-based award collaborations involving companies or NGOs (4/29, 14%).

Table 17. Number of ITCR-based Award Collaborations

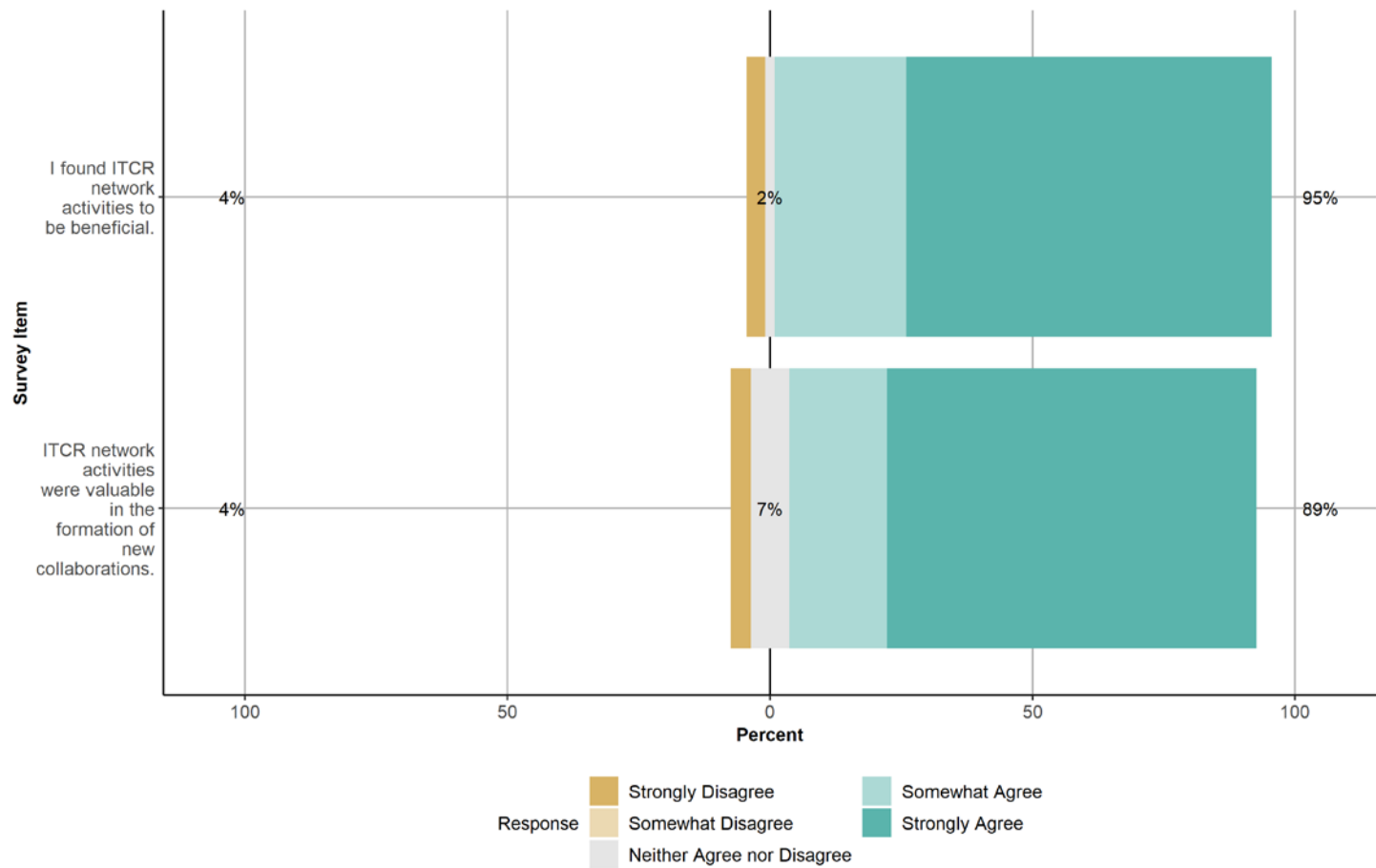
Number of ITCR-based Award Collaborations	Number of Responses
1	16
2	6
3	5
4	1
No response provided	1

Note: Table reports results at respondent/individual level from among the 29 respondents who indicated that they participated in ITCR-based award collaborations

5. Satisfaction with ITCR Network Activities

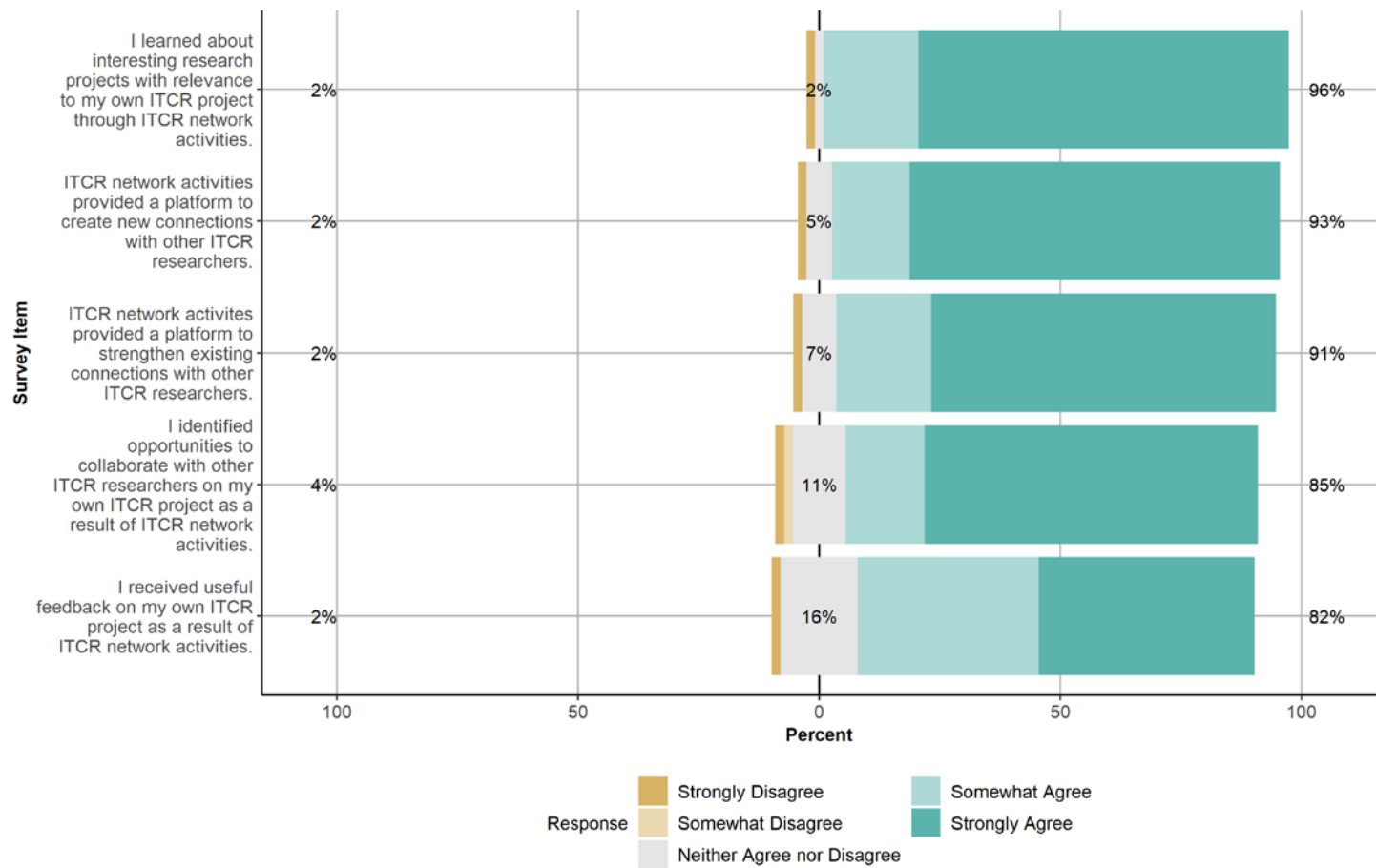
In a final section of the survey, ITCR investigators were asked to assess their level of satisfaction with ITCR network activities, such as participating at annual meetings, working groups, monthly PI conference calls, and outreach events coordinated through the program. Respondents reported high levels of satisfaction with these activities (95% indicated that they agreed or strongly agreed that the activities were beneficial; 89% indicated that they agreed or strongly agreed that the activities were valuable in the formation of new collaborations) (Figure 3). Respondents also indicated that these activities provided a platform to create new connections with other ITCR researchers (93% agreed or strongly agreed) or to strengthen existing connections with other ITCR researchers (91% agreed or strongly agreed). Respondents agreed that the benefits of network activity participation included creating opportunities (1) to collaborate on ITCR projects, (2) to learn about interesting research projects with relevance to their own projects, and (3) to receive feedback on their ITCR projects (Figure 4).²¹ In an open-ended response, most respondents indicated that annual meetings were the most useful in creating these opportunities. Monthly PI conference calls were the second most frequently commented-upon activities, though many respondents commented on the utility of the activities more generally, in some cases describing specific collaborations that arose directly from participation. Several respondents also mentioned ITCR working groups and ITCR outreach activities, for the most part positively as facilitators of collaboration. A few respondents specifically called out the NCI program staff as being helpful, with a sample comment being, “The NCI Program Directors have done a very good job of facilitating connections.”

²¹ It should be noted that most indications of strong dissatisfaction with network activities came from two individuals (rather than from many individuals expressing disapproval with individual aspects of the network). As the qualitative responses those individuals provided were that the annual meetings and monthly calls were useful, it is possible that these respondents misread the Likert scale and intended to indicate satisfaction with network activities. Stratifications identified few differences, with the only notable (though not statistically significant) difference being that the R01/R21 investigators were less satisfied with the network’s activities intended to provide opportunities to collaborate than were investigators associated with the U01 and U24 awards.



Note: Figure reports results at respondent/individual level.

Figure 3. Overall View of ITCR Network Activities and their Role in Promoting Collaboration



Note: Figure reports results at respondent/individual level.

Figure 4. Satisfaction with Individual ITCR Network Activities

Overall, respondents reported high levels of satisfaction with the ITCR program and its collaborative aspects. When asked how ITCR network activities might be improved, a number of respondents indicated that the program and its collaborative activities, such as the annual meeting, should be continued or expanded. Other PIs suggested additional mechanisms aimed at fostering collaborations within the ITCR network or between NCI and other NCI programs (e.g., supplemental funding, a data sharing forum, hackathons). One specific suggestion in this realm was to fund projects to apply ITCR-funded tools to specific challenging cancers. Other respondents encouraged additional outreach activities, such as special issues in journals and networking sessions at conferences. A number of respondents commented on meeting logistics—one suggested hosting the annual meeting at a location other than NCI to avoid logistical challenges, and one indicated that alternating the day and time of the PI meeting every other month would be useful; another suggested that investigators outside of ITCR be invited to participate in the annual meeting, and one other PI suggested dividing the monthly calls into smaller groups with cohesive research foci. Finally, one PI commented that the review process is not well adapted to the unique features of the ITCR program (in, for example, its focus on papers and citations as outputs considered during renewal review).

6. Summary Findings

The survey results lead to six summary findings regarding collaboration in the context of ITCR awards.

A. ITCR Has Supported the Formation of Core Teams that Tend to Be Multidisciplinary and Multi-institutional

“Core team members” were defined explicitly for survey participants as research staff members/staff scientists fully or partially supported by the core ITCR award. At the award level, among the 41 awards whose contact PIs reported CTMs, 80% (33/41) reported at least one CTM from a different academic department, 59% (24/41) of awards reported at least one CTM from a different institution, and 22% (9/41) reported at least one non-academic CTM. Among the 171 core ITCR team members named, 47 (27%) originated from the same department within the same institution as the respondent who named them, 46 (27%) originated from the same institution but a different department, 4 (2%) were identified as belonging to the same department (but not the same institution), 22 (13%) were identified as non-academic partners, and the remaining 52 (30%) fit none of the categories, suggesting that they were academic collaborators at other institutions and in different departments. U24s and investigators whose awards are complete were significantly more likely to report multi-institutional CTM groups that respondents associated with other activity codes and active awards. Although qualitative responses did not provide specific insight into why this might be the case, these results are intuitive; the largest awards would be most likely to form complex teams, and if collaborators are added over time it would be expected that active awards might not yet be at a stage where the full extent of their eventual collaborations would be realized. A less explicable finding is that with respect to the scientific character of the informatics technologies developed, –omics awardees were least likely to report non-academic CTM partners, multi-institutional CTM groups, and multi-departmental CTM groups.

B. The Large Majority of ITCR Awardees Form Additional Collaborations, Including with Members of other ITCR-Supported Teams

Survey respondents also reported forming or strengthening collaborations with individuals outside of their CTMs as a result of their ITCR awards. Among those respondents reporting on the relevant questions, 98% (53/54) indicated that they formed new connections with one or more types of collaborators, and 87% (46/53) indicated that

they strengthened connections with existing collaborators as a result of their ITCR award. Notably, 87% (46/53) of respondents identified forming or strengthening collaborations with at least one other ITCR investigator. In their qualitative responses, survey respondents described the nature of their collaborations. The most prevalent form of ITCR-ITCR collaboration concerned linking or integrating ITCR-supported tools, followed by collaborating to develop new methods or to add functionality to existing ITCR tools.

C. ITCR Administrative Supplements and Set-aside Projects Further Deepen Collaborations, Especially Among Awardees with Cooperative Agreements

The ITCR program has used two mechanisms to foster collaborations across awards. In the early years of the initiative, administrative supplements were used to foster collaboration. In the current round of awards, PIs of the cooperative agreements (i.e., U01 and U24 awards) have been directed to reserve 10% of their budgets for collaborative projects. Approximately half of the contact PIs returning surveys report using these funds to support collaborative activities. As would be expected, there were statistically significant differences by activity code, with U24 awardees being most likely to report use of funds for these activities. –Omics PIs were also significantly more likely to report using supplements and set-aside funds. Free-text responses predominantly mentioned using set-aside/supplementary funding to develop new methods and tools or to link/integrate existing ITCR-supported tools.

D. Several ITCR Awardees Make Use of Commercial Subcontracts as Part of their Software Development Process

One-sixth of the awardee contact PIs identified that their projects engaged in commercial subcontracts. Completed awards were more likely than active awardees to report commercial subcontracting, which again may reflect differences associated with the award life-cycle. Respondents who used sub-award contracts to engage commercial firms in their ITCR projects described those relationships as providing software engineering expertise, whether with respect to developing the user interface and enhancing the user experience, making software more easily installable, providing software support and maintenance, and assisting with training and user support.

E. Approximately Half of ITCR Awardees Report Follow-on Activities Leveraging their ITCR Awards

Twenty-nine of 55 (53%) respondents answering the relevant question reported that they are PIs or co-PIs on applications for additional awards based on collaborations formed during their ITCR work, whether planned, in preparation, submitted, or awards received. The R01 and R21 awardees were less likely to report follow-on activities than respondents

associated with ITCR cooperative agreements, though differences were not statistically significant. Most (55%) of those 29 respondents reported one ITCR-based award collaboration, though others reported up to four. More than half of the respondents reporting ITCR-based award collaborations indicated that those collaborations involved CTMs (17/29, 59%), other ITCR investigators (18/29, 62%), and other (non-ITCR) investigators (18/29, 62%). Fewer reported ITCR-based award collaborations involving companies or NGOs (4/29, 14%).

F. ITCR Awardees Report High Levels of Satisfaction with Network Activities

Respondents reported high levels of satisfaction with ITCR network activities, such as participating in annual meetings, working groups, monthly PI conference calls, and outreach events coordinated through the program. (95% indicated that they agreed or strongly agreed that the activities were beneficial; 89% indicated that they agreed or strongly agreed that the activities were valuable in the formation of new collaborations) Respondents also indicated that these activities provided a platform to create new connections with other ITCR researchers (93% agreed or strongly agreed) or to strengthen existing connections with other ITCR researchers (91% agreed or strongly agreed). In an open-ended response, most respondents indicated that annual meetings were the most useful in creating these opportunities. A few free-text respondents specifically called out the NCI program staff as being helpful. When asked in an open-ended question about future enhancements to the program, several respondents suggested additional mechanisms aimed at fostering collaborations within the ITCR network or between NCI and other NCI programs (e.g., supplemental funding, a data sharing forum, hackathons). One specific suggestion in this realm was to fund projects to apply ITCR-funded tools to specific challenging cancers. Other respondents encouraged additional outreach activities, such as special issues in journals and networking sessions at conferences.

Appendix A.
ITCR Survey Instrument

ITCR Collaboration Survey

Introduction

The National Cancer Institute Center for Biomedical Informatics and Information Technology tasked the IDA Science and Technology Policy Institute with conducting an evaluation of the Informatics Technology for Cancer Research (ITCR) initiative. One component of this evaluation is a survey that has been designed to capture the perspective of ITCR PIs and co-PIs. Your participation in this study is very important and will inform decisions about ITCR in the future.

This survey contains a series of questions about your experiences as an ITCR investigator (PI or co-PI). Most people will be able to complete this survey in 20-30 minutes, and it should take no longer than 45 minutes. If you wish to complete the survey in multiple sittings, your responses will be saved. However, please note that once you submit your responses, you will not be able to edit them.

The goal of this survey is to gather information on your perspective on collaboration related to your ITCR award. Specific topics to be addressed include

- Collaborations within your core ITCR team
- Collaborations with individuals or groups outside of your core ITCR team
- Subsequent award applications with ITCR collaborators
- The role of ITCR network activities in fostering collaboration

Our records indicate that you were a PI or co-PI on the ITCR award number [invite('custom 1')].

All questions in this survey refer to this ITCR award. If you received multiple awards, you will receive additional emails requesting information on your experiences with those awards. Please note that all named PIs and co-PIs for each award will be receiving this survey and that we hope to collect information from all named investigators rather than on a per-award basis. In addition, this survey is designed to accept responses from individuals working on your behalf, so if you feel that there is another individual better equipped to answer questions on collaborations associated with your ITCR award, please feel free to forward this link.

Your participation in this survey is completely voluntary. Individual answers will not be

made public, and the information you provide will only be used in aggregate form and will not be attributed directly to you. Your responses will in no way impact your relationship with NCI or the ITCR initiative.

If you have any questions or concerns about the survey, please contact Dr. Brian Zuckerman at 202-419-5485 or at bzuckerm@ida.org. If you would like to verify the authenticity of this survey, please contact Juli Klemm at klemmj@mail.nih.gov.

Thank you again for your participation.

Logic Show/hide trigger exists.

1. Are you Dr. [contact("last name")]?

- Yes, I am [contact("last name")].
- No, I am a representative completing this survey on [contact("last name")]’s behalf.

Logic Hidden unless: #1 Question "Are you Dr. [contact("last name")]? " is one of the following answers ("No, I am a representative completing this survey on [contact("last name")]’s behalf.")

2. Please provide your name and email address in the text fields below. This information will only be used in the event that we need to seek clarification or additional information about your responses to this survey.

Name

Email Address

Relationship to PI

Important Information about the Scope of this Survey

For our purposes, collaboration is defined as the social processes whereby human beings pool their human capital in pursuit of a shared objective.*

Throughout this survey you will be asked to identify collaborators. At a minimum, collaboration requires:

- (1) sharing information and resources,
- (2) defined roles in the pursuit of a shared objective,
- (3) frequent communication, and
- (4) shared decision making.

Note that these characteristics represent a minimum standard of collaboration for our purposes and that we are also interested in hearing about individuals with whom you work even more closely. For example, core team members, with whom you might communicate frequently in a way that is characterized by mutual trust and with whom you might reach consensus on all decisions, would also be considered collaborators under our definition.

*Definition adapted from Bozeman, B., Fay, D., & Slade, C.P. (2013). Research collaboration in universities and academic entrepreneurship: the state-of-the-art. *The Journal of Technology Transfer*, 38(1):1-67.

Core ITCR Team Collaborations

Page description:

In this section of the survey, we would like to learn about [collaborations](#)At a minimum, collaboration requires:

- (1) [sharing information and resources.](#)
- (2) [defined roles in the pursuit of a shared objective.](#)
- (3) [frequent communication, and](#)
- (4) [shared decision making.](#) within your *core ITCR team*.

A *core ITCR team member* is defined as a research staff member/staff scientist *fully or partially* supported by your core ITCR award. We are specifically interested in learning about who these individuals are, whether these collaborations were new or existed prior to the ITCR award, and how you connected with any new collaborators.

When considering *core ITCR team members*, please

- **Include** any co-PIs named on your ITCR application
- **Include** research staff members/staff scientists supported by your core ITCR award but not formally named as co-PIs
- **Include** other research collaborators, such as medical doctors (unless otherwise excluded below)
- **Exclude** undergraduates, graduate students, and postdoctoral fellows
- **Exclude** commercial firms (or individuals serving as points of contact with commercial firms) with whom you contracted through subawards
- **Exclude** individuals who were supported solely by supplements to your ITCR award
- **Exclude** individuals who were supported solely by annual ITCR budget set aside funding designated for collaborative activities

Please note that later questions will be devoted to commercial firms and individuals who were supported by ITCR award supplements or annual budget set-aside funding.

Page exit logic: Skip / Disqualify Logic

IF: #3 Question "Do you have any core ITCR team members to report?" is one of the following answers ("No, I do not have core ITCR team members to report.") **THEN:** Jump to [page 6 - Software Development through Subaward Contracts](#)

Logic: Show/hide trigger exists.

3. Do you have any core ITCR team members to report?

- Yes, I have core ITCR team members to report.
- No, I do not have core ITCR team members to report.

Logic: Hidden by default Hidden unless: #3 Question "Do you have any core ITCR team members to report?" is one of the following answers ("Yes, I have core ITCR team members to report.")

Please list the names of individuals who were core ITCR team members. If your team consisted of more than six individuals, please list the names of the six team members with whom you worked most closely on your ITCR award.

Name

Core ITCR Team Member 1	<input type="text"/>
Core ITCR Team Member 2	<input type="text"/>
Core ITCR Team Member 3	<input type="text"/>
Core ITCR Team Member 4	<input type="text"/>
Core ITCR Team Member 5	<input type="text"/>
Core ITCR Team Member 6	<input type="text"/>

Core Team Attributes

Page description:

The following set of questions is aimed at capturing the attributes of team complexity and diversity.

Logic: Show/hide trigger exists.

collaborator 1 **Action: Hidden Value**
Value: [question("value"), id="101"]

Logic: Show/hide trigger exists.

collaborator 2 **Action: Hidden Value**
Value: [question("value"), id="102"]

Logic: Show/hide trigger exists.

collaborator 3 **Action: Hidden Value**
Value: [question("value"), id="103"]

Logic Show/hide trigger exists.
collaborator_4 **Action: Hidden Value**
Value: [question("value"), id="104"]

Logic Show/hide trigger exists.
collaborator_5 **Action: Hidden Value**
Value: [question("value"), id="105"]

Logic Show/hide trigger exists.
collaborator_6 **Action: Hidden Value**
Value: [question("value"), id="106"]

4. For each core ITCR team member listed, please select the statement(s) that describe the nature of their affiliations at the time of the core ITCR award start date. Select all that apply.

This core ITCR team member was employed by my academic institution/organization at the time of the core ITCR award start date.

This core ITCR team member was in my academic department at the time of the core ITCR award start date.

This core ITCR team member was a non-academic partner.

4. For each core ITCR team member listed, please select the statement that best describes nature of your [collaborative](#) relationship prior to your ITCR collaboration: [At a minimum, collaboration requires:](#)
[\(1\) sharing information and resources.](#)
[\(2\) defined roles in the pursuit of a shared objective.](#)
[\(3\) frequent communication, and](#)
[\(4\) shared decision making.](#)

	Prior to our ITCR collaboration, I had an established relationship with this individual but had never formally collaborated with him or her.	Prior to our ITCR collaboration, I was aware of this individual and his or her work but had never formally collaborated with him or her.	Prior to our ITCR collaboration, I was unaware of this individual.	I don't recall.
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Core Team Formation

6. In the previous question, you mentioned that you formed new collaborations with at least one core ITCR team member. Please briefly describe how you came to collaborate with these individuals in the text field below:

[question("value"), id="101"]

[question("value"), id="102"]

[question("value"), id="103"]

[question("value"), id="104"]

[question("value"), id="105"]

[question("value"), id="106"]

Software Development through Subaward Contracts

Page description:

In this section of the survey, we are interested in learning about collaborations with commercial firms forged through ITCR subaward contracts.

Logic Show/hide trigger exists.

7. Did you involve (through a subaward contract) a commercial firm in the ITCR tool/software development process ?

- Yes, a commercial firm was involved.
- No, a commercial firm was *not* involved.

Logic: Hidden unless: #7 Question "Did you involve (through a subaward contract) a commercial firm in the ITCR tool/software development process?" is one of the following answers ("Yes, a commercial firm was involved.")

8. In your previous response you indicated that your ITCR work involved a commercial firm in the software/tool development process. In the text box below, please provide a brief response detailing the type of work the commercial firm provided and how well the firm met the stipulations of the contract.

External Collaborations

Page description:

In the next set of questions, we will ask you about collaborations with individuals external to the core ITCR team. In formulating your responses, please consider individuals or groups of individuals with whom you substantively interacted in a capacity related to your core ITCR work (excluding work conducted under supplements and subawards, if applicable) but *who were not directly supported by your ITCR award*.

9. Please indicate whether you formed or strengthened [collaborations](#)At a minimum, [collaboration requires:](#)
[\(1\) sharing information and resources.](#)
[\(2\) defined roles in the pursuit of a shared objective.](#)
[\(3\) frequent communication, and](#)
[\(4\) shared decision making.](#) with the following collaborator types as a result of activities related to your core ITCR award:

	Yes	No	I don't recall
I formed new collaborations with investigators funded by <i>other ITCR awards</i> as a result of my core ITCR award.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I strengthened existing collaborations with investigators funded by <i>other ITCR awards</i> as a result of my core ITCR award.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I formed new collaborations with <i>other investigators</i> (excluding ITCR-funded investigators) as a result of my core ITCR award.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I strengthened existing collaborations with <i>other investigators</i> (excluding ITCR-funded investigators) as a result of my core ITCR award.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I formed new collaborations with <i>companies/NGOs</i> as a result of my core ITCR award.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I strengthened existing collaborations with <i>companies/NGOs</i> as a result of my core ITCR award.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Action: JavaScript
 Allow to deselect radio button

External Collaborations

Action: Custom Script
 Show Text fields only if agreed with statement

10. In your previous response, you indicated that you formed new collaborations or strengthened existing collaborations with other ITCR funded teams as a result of your core ITCR award. Can you please provide some additional information about the nature of these collaborations (e.g., those collaborations centered around building upon other ITCR-funded tools, creating new capabilities, etc.)?

11. In your previous response, you indicated that you formed new collaborations or strengthened existing collaborations with other funded researchers (not funded through ITCR) as a result of your core ITCR award. Can you please provide some additional information about the nature of these collaborations (e.g., those collaborations centered around building upon other ITCR-funded tools, creating new capabilities, etc.)?

12. In your previous response, you indicated that you formed new collaborations or strengthened existing collaborations with companies/NGOs as a result of your core ITCR award. Can you please provide some additional information about the nature of these collaborations (e.g., those collaborations centered around building upon other ITCR-funded tools, creating new capabilities, etc.)?

Set-Aside Funding and Administrative Supplements

Page description:

In this portion of the survey, we will ask you a series of questions about annual budget set-aside funding and awards granted as supplements to your ITCR award used to support collaborative or joint activities within or beyond ITCR projects. In particular, we are interested in learning more about collaborations formed as a result of that funding/those supplements.

Logic: Show/hide trigger exists.

13. Have you used annual budget set-aside funding to support collaborative or joint activities within or beyond ITCR projects that were initiated post-award?

- Yes
- No

Logic: Hidden unless: #13 Question "Have you used annual budget set-aside funding to support collaborative or joint activities within or beyond ITCR projects that were initiated post-award?" is one of the following answers ("Yes")

14. In your previous response, you indicated that you used annual budget set-aside funding to support joint or collaborative activities. Can you please provide some additional information about the nature of those activities?

Logic: Show/hide trigger exists.

15. Did you receive supplementary funding through PA-17-143 "Activities to Promote Technology Research Collaborations (APTRC) for Cancer Research" or other administrative supplements that you used to support collaborative or joint activities?

- Yes, I *did* receive supplemental funding.
- No, I *did not* receive supplemental funding.

Logic: Hidden unless: #15 Question "Did you receive supplementary funding through PA-17-143 "Activities to Promote Technology Research Collaborations (APTRC) for Cancer Research" or other administrative supplements that you used to support collaborative or joint activities?" is one of the following answers ("Yes, I *did* receive supplemental funding.")

16. In your previous response, you indicated that you used administrative supplements to support joint or collaborative activities. Can you please provide some additional information (approximately one paragraph) about the nature of those activities?

Logic Hidden unless: (#15 Question "Did you receive supplementary funding through PA-17-143 "Activities to Promote Technology Research Collaborations (APTRC) for Cancer Research" or other administrative supplements that you used to support collaborative or joint activities? " is one of the following answers ("Yes, I *did* receive supplemental funding.") OR #13 Question "Have you used annual budget set-aside funding to support collaborative or joint activities within or beyond ITCR projects that were initiated post-award? " is one of the following answers ("Yes"))

17. Please indicate the extent whether you formed or strengthened [collaborationsAt a minimum, collaboration requires:](#)

- [\(1\) sharing information and resources.](#)
- [\(2\) defined roles in the pursuit of a shared objective.](#)
- [\(3\) frequent communication, and](#)
- [\(4\) shared decision making.](#)

with the following collaborator types as a result of activities related to ITCR award supplements or annual budget set-aside funding:

	Yes	No	I don't recall
I formed new collaborations with investigators funded by <i>other ITCR awards</i> as a result of an ITCR award supplement or annual budget set-aside funding.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I strengthened existing collaborations with investigators funded by <i>other ITCR awards</i> as a result of an ITCR award supplement or annual budget set-aside funding.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I formed new collaborations with <i>other investigators</i> (excluding ITCR-funded investigators) as a result of an ITCR award supplement or annual budget set-aside funding.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I strengthened existing collaborations with <i>other investigators</i> (excluding ITCR-funded investigators) as a result of an ITCR award supplement or annual budget set-aside funding.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I formed new collaborations with <i>companies/NGOs</i> as a result of an ITCR award supplement or annual budget set-aside funding.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I strengthened existing collaborations with <i>companies/NGOs</i> as a result of an ITCR award supplement or annual budget set-aside funding.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Set-Aside Funding and Administrative Supplements

Action: Custom Script

Show Text fields only if agreed with statement

18. In your previous response, you indicated that you formed new collaborations or strengthened existing collaborations with other ITCR funded teams as a result of annual budget set-aside funding or an ITCR award supplement. Can you please provide some additional information about the nature of these collaborations (e.g., those collaborations centered around building upon other ITCR-funded tools, creating new capabilities, etc.)?

19. In your previous response, you indicated that you formed new collaborations or strengthened existing collaborations with other funded researchers (not funded through ITCR) as a result of annual budget set-aside funding or an ITCR award supplement. Can you please provide some additional information about the nature of these collaborations (e.g., those collaborations centered around building upon other ITCR-funded tools, creating new capabilities, etc.)?

20. In your previous response, you indicated that you formed new collaborations or strengthened existing collaborations with companies/NGOs as a result of annual budget set-aside funding or an ITCR award supplement. Can you please provide some additional information about the nature of these collaborations (e.g., those collaborations centered around building upon other ITCR-funded tools, creating new capabilities, etc.)?

ITCR-Based Award Collaborations

Page description:

In this section, we are interested in understanding more about the effects of your ITCR-funded research on additional award applications (excluding applications for supplements, if applicable). More specifically, we would like to know if you are a named investigator (PI or co-PI) on any NCI funding application (planned, in preparation, submitted, or received; grant, cooperative agreement, or contract) that is a collaboration formed as a result of your core ITCR award (excluding supplements, if applicable). These award applications do not need to be an extension of your ITCR-funded research and are collectively termed *ITCR-based award collaborations*.

Logic Show/hide trigger exists.

21. Are you a named investigator (PI or co-PI) on an *ITCR-based award collaboration*?

- Yes, I am a PI or co-PI on an *ITCR-based award collaboration*.
- No, I am not a PI or co-PI on an *ITCR-based award collaboration*.
- I don't recall.

LOGIC: Hidden unless: #21 Question "Are you a named investigator (PI or co-PI) on an *ITCR-based award collaboration*?"

" is one of the following answers ("Yes, I am a PI or co-PI on an *ITCR-based award collaboration*.")

22. On how many *ITCR-based award collaborations* are you a named investigator (PI or co-PI)?

LOGIC: Hidden unless: #21 Question "Are you a named investigator (PI or co-PI) on an *ITCR-based award collaboration*?"

" is one of the following answers ("Yes, I am a PI or co-PI on an *ITCR-based award collaboration*.")

23. Considering all of your *ITCR-based award collaborations*, please indicate the types of collaborators on these awards (check all that apply):

- Current/Former core ITCR team member(s)
- Collaborator(s) funded by other ITCR award(s)
- Non-ITCR-funded investigator(s)
- Companies/NGOs

Startups and Other Collaborative Activities

Page description:

In the next set of questions, we are interested in learning about the creation of startups or nonprofits and any other collaborative activities that may have resulted from your ITCR award.

LOGIC: Show/hide trigger exists.

24. Did you form a startup or nonprofit as a result of activities associated with your ITCR award?

- Yes, I *did* form a startup or nonprofit.
- No, I *did not* form a startup or nonprofit.

Logic: Hidden unless: #24 Question "Did you form a startup or nonprofit as a result of activities associated with your ITCR award?" is one of the following answers ("Yes, I *did* form a startup or nonprofit.")

25. What is the name of the startup or nonprofit that you formed as a result of activities associated with your ITCR award?

Logic: Hidden unless: #24 Question "Did you form a startup or nonprofit as a result of activities associated with your ITCR award?" is one of the following answers ("Yes, I *did* form a startup or nonprofit.")

26. In your previous response, you indicated that you formed a startup or nonprofit as a result of activities associated with your ITCR award. Using the text box below, please provide some additional details about the purpose of the startup (e.g., to develop or disseminate tools created through ITCR, to provide ongoing support for software or tools created through ITCR) and the process of forming that startup or nonprofit, focusing specifically on the collaborative activities that were crucial to its formation.

Logic: Show/hide trigger exists.

27. Beyond additional grant applications and the formation of startups/nonprofits, are there any other ongoing [collaborative](#) activities that resulted from your ITCR award? [At a minimum, collaboration requires:](#)
[\(1\) sharing information and resources.](#)
[\(2\) defined roles in the pursuit of a shared objective.](#)
[\(3\) frequent communication, and](#)
[\(4\) shared decision making.](#)

- Yes
- No

Logic: Hidden unless: #27 Question "Beyond additional grant applications and the formation of startups/nonprofits, are there any other ongoing collaborative activities that resulted from your ITCR award?" is one of the following answers ("Yes")

28. In your previous response you indicated that there are other ongoing collaborative activities that resulted from your ITCR award. Using the text field below, please provide some additional information about those activities, including a brief description of the activities and the ways in which ITCR led to their development.

ITCR Network Activities

Page description:

As you are aware, ITCR awardees are expected to engage in collaborative activities of the ITCR program, including participating in annual meetings, working groups, monthly PI conference calls, and outreach events coordinated through the program. We will refer to these activities collectively as *ITCR network activities*. In this portion of the survey, we would like to know a little bit more about your satisfaction with and the nature of your experience with ITCR network activities.

29. Please indicate the extent to which you disagree or agree with the following statements regarding your satisfaction with ITCR network activities:

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
I found ITCR network activities to be beneficial.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITCR network activities were valuable in the formation of new collaborations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

30. Please indicate the extent to which you disagree or agree with the following statements regarding the nature of your experience with ITCR network activities:

	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
ITCR network activities provided a platform to create new connections with other ITCR researchers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ITCR network activities provided a platform to strengthen existing connections with other ITCR researchers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I identified opportunities to collaborate with other ITCR researchers on my own ITCR project as a result of ITCR network activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I learned about interesting research projects with relevance to my own ITCR project through ITCR network activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I received useful feedback on my own ITCR project as a result of ITCR network activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

31. ITCR network activities include annual meetings, working groups, monthly PI conference calls, and outreach events coordinated through the program. Please comment on the different types of ITCR network activities. Were some activities more helpful in fostering collaboration than others? If so, please state which activities.

32. Do you have any suggestions for improving ITCR network activities in the future?

Thank You!

Thank you for taking our survey. Your response is very important to us.

REPORT DOCUMENTATION PAGE

*Form Approved
OMB No. 0704-0188*

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

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1. REPORT DATE (<i>DD-MM-YYYY</i>)	2. REPORT TYPE	3. DATES COVERED (<i>From - To</i>)
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4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
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9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER (<i>Include area code</i>)