Project Update to the National Institute of Justice:

NIJ R&D Portfolio Management and Technology Transition Support

July
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National Institute of Justice
Office of Investigative and Forensic Sciences
810 Seventh Street, N.W.
Washington, D.C. 20531

Award #2011-DN-BX-K564

NIJ National Institute of Justice

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The information shared in this report represents the opinions of the individual practitioners and researchers who participated in this R&D portfolio management plan and not the opinions of their agencies or the National Institute of Justice. In addition, the individual case managers were not part of the technology selection process; the transition planning was performed by FTCoE staff. Finally, no individual involved in this process received any financial or materials support from the manufacturers of any technology included in this evaluation. For more information or questions about this report, visit www.forensiccoe.org, or contact jerimiller@rti.org or 919-485-5685.

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BACKGROUND

NIJ Forensics R&D

The National Institute of Justice (NIJ) is the research, development, and evaluation agency for the U.S. Department of Justice (DOJ). As part of its mission, NIJ funds research and development (R&D) grants across all forensic disciplines, with a particular focus on improving capabilities to expand the information that can be extracted from traditional types of forensic evidence and to quantify its evidentiary value. The NIJ's investment in R&D is also aimed at developing reliable and widely applicable tools and technologies that allow faster, cheaper, and less labor-intensive identification, collection, preservation, and analysis of forensic evidence of all kinds, as well as the reduction of existing case backlogs.[1] NIJ's Forensic Science R&D Program prioritizes research that has a direct impact on forensic science policy and practice. R&D investment ultimately matures forensic science related to useful materials, devices, systems, or methods that have the potential for forensic application (www.nij.gov).

From 2003 to 2012, the NIJ funded approximately 355 R&D grants in the forensic sciences (henceforth referred to as the R&D portfolio).[2,3] Two-thirds of these grants were for Applied[4] research, while the remainder were for Basic[5] research. Among these projects, Forensic DNA projects represented roughly 50% of NIJ's R&D award budget. The other discipline categories funded were Anthropology; Controlled Substances; Crime Scene Investigation; Digital Forensics; Entomology; Fire and Arson; Friction Ridge; General Forensics (e.g., statistics); Impression Evidence (e.g., bloodstain pattern analysis, firearm and toolmark examinations); Pathology; Questioned Documents; Toxicology; and Trace Evidence.

This report was developed by the Forensic Technology Center of Excellence (FTCoE) to document the purpose of, and processes related to, the management of NIJ's R&D portfolio to increase impact for forensic applications. The ultimate goal of the portfolio management process is to enable the use of the NIJ-funded solutions by various parts of the forensic community. The successful outcome may take the form of commercialization (e.g., new products), technology implementation (e.g., new processes), or knowledge transfer (e.g., new understanding). The process seeks to find R&D that, with additional support, can have a greater impact. This effort does not evaluate the R&D projects themselves, nor does it seek to identify the best technology for a given application; rather, it focuses on the technology adoption efforts needed to successfully move the technology from the R&D laboratory to the forensic practitioner laboratory or field application. The process is a rapid way to bring forward opportunities for the FTCoE to augment the investment made by NIJ to push the R&D to greater adoption.

[1] http://www.nij.gov/topics/forensics/pages/priorities.aspx

[2] Does not include funding for Paul Coverdell Forensic Science Improvement Grants Program, DNA Backlog Reduction Program to States, Research Fellowships, or Research and Evaluation in Social Sciences.

[3] While data going back to fiscal year 2003 are included, prior to fiscal year 2007, the lists may not be complete.

[4] An Applied research award is a systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met.

[5] A Basic research award is a systematic study directed toward a greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward any processes or products in mind.

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Forensic Science Technology Center of Excellence (FTCOE)

Since 2011, RTI International (RTI)[6] and its partner universities[7] have operated the FTCoE for the NIJ. The FTCoE is tasked by the NIJ to be a bridging organization within the forensic community to enable adoption of technology solutions. The FTCoE helps the NIJ consider how well a solution addresses the intended functional requirement. This determination can range from market analysis (for early-stage solutions) to real testing (for mature solutions).

Ultimately, the FTCoE works with the NIJ to facilitate the introduction of the solution into practice. After adoption, the solution's impact on practice is evaluated.[8] Thus, the FTCoE plays a critical role by identifying promising R&D solutions that may have a substantial impact on practice and be worthy of further NIJ investment.

NIJ R&D Portfolio Management Process

To assist in bringing impactful solutions to the forensic community, the FTCoE has worked to develop an R&D portfolio management process for NIJ.

This effort includes the following actions:

- Creation, population, and maintenance of an R&D Portfolio Database containing NIJ R&D research grants
- Analysis of the R&D grants to identify
  - R&D outcomes with demonstrated value in the form of use, publications, and presentations
  - R&D with the potential for broader impact through additional FTCoE and stakeholder support
- Plan for and provide technology transition support for selected R&D
- Communicate successful transition and adoption
- Execute a steady-state process for managing NIJ's R&D portfolio of grants for technology transition support.

The ultimate goal of the portfolio management process is to enable the use of the NIJ-funded solutions by the forensic community. The successful outcome may take the form of commercialization, technology implementation, or knowledge transfer. It is also important to communicate NIJ R&D transition successes to further encourage adoption and to motivate participants, including the following:

- **Science** – Researchers working specifically in forensic disciplines, as well as researchers working in non-forensic applications but who enable technology areas (e.g., DNA); NIJ grantees; and state and local laboratories.
- **Justice** – Individuals working for the systemic collection and flow of evidence from crime scenes to courtrooms, including law enforcement, lawyers, judges, and other forensic practitioners in the criminal justice system, such as those working at U.S. federal agencies (e.g., the National Institute for Standards and Technology, the Federal Bureau

[6] RTI International is a trade name of Research Triangle Institute.

[7] Duquesne University; Virginia Commonwealth University; University of North Texas; West Virginia University; University of Central Florida; Midwest Forensic Resource Center

[8] http://www.nij.gov/topics/technology/pages/research-development-process.aspx,

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of Investigations, the U.S. Department of Homeland Security, the Secret Service, NIJ, the Drug Enforcement Administration, and the U.S. Department of Defense [DOD]).

- **Society** – The public.

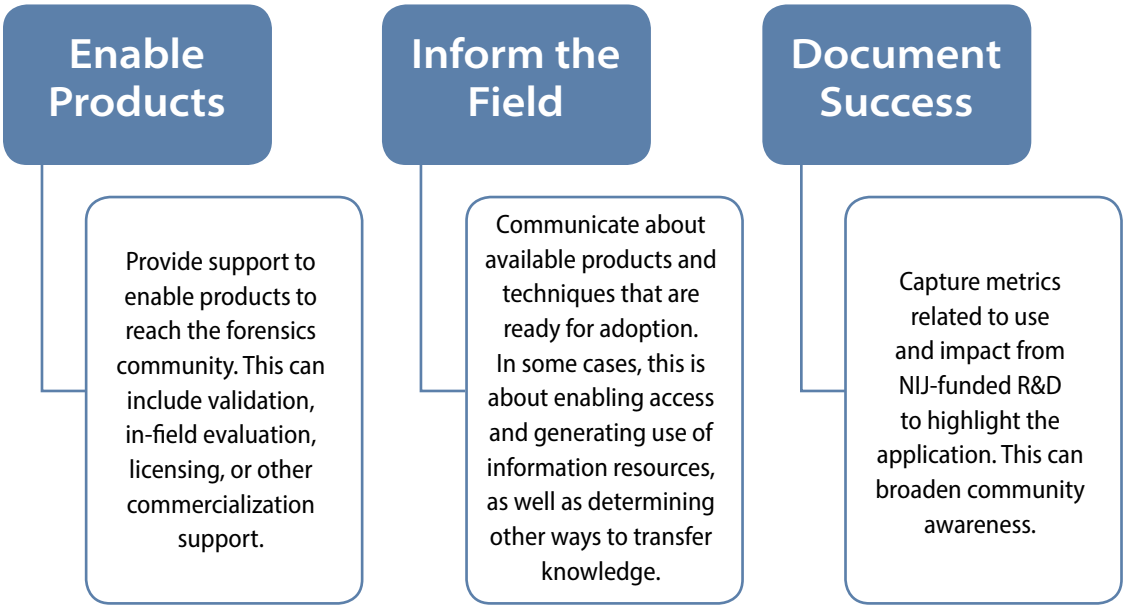
Benefits of FTCoE's process to support management of NIJ's R&D portfolio include the following:

1. Connecting to NIJ's funded principal investigators (PIs) to understand the status, impact, and needs related to transition of their research into useful application.
2. Imparting a culture within the forensic community related to the need to gain impact from funded research to valuable application.
3. Collecting, analyzing, maintaining, and disseminating performance metrics on NIJ forensic R&D awards.
4. Identifying R&D that can benefit from FTCoE transition support to gain broader impact.

The following report presents the process, results to date, and continued planning related to the FTCoE's management of technology transition support for NIJ's R&D portfolio. As illustrated in **Figure 1**, the goal of these efforts is to drive research funding into impact through the use of new products, information being available to the community, and continuous support and improvement for NIJ research.

This report is a continuation of a December 2012 preliminary report, *Project Update: NIJ R&D Portfolio – Performance Database and Technology Transition Assessment*, which outlined the plan for developing this process and the preliminary results at that time. Since the 2012 report, the FTCoE has continued to work to document and understand the NIJ's R&D portfolio and to identify and plan for transition efforts.

Figure 1. Impact of FTCoE's transition support of NIJ's R&D portfolio.



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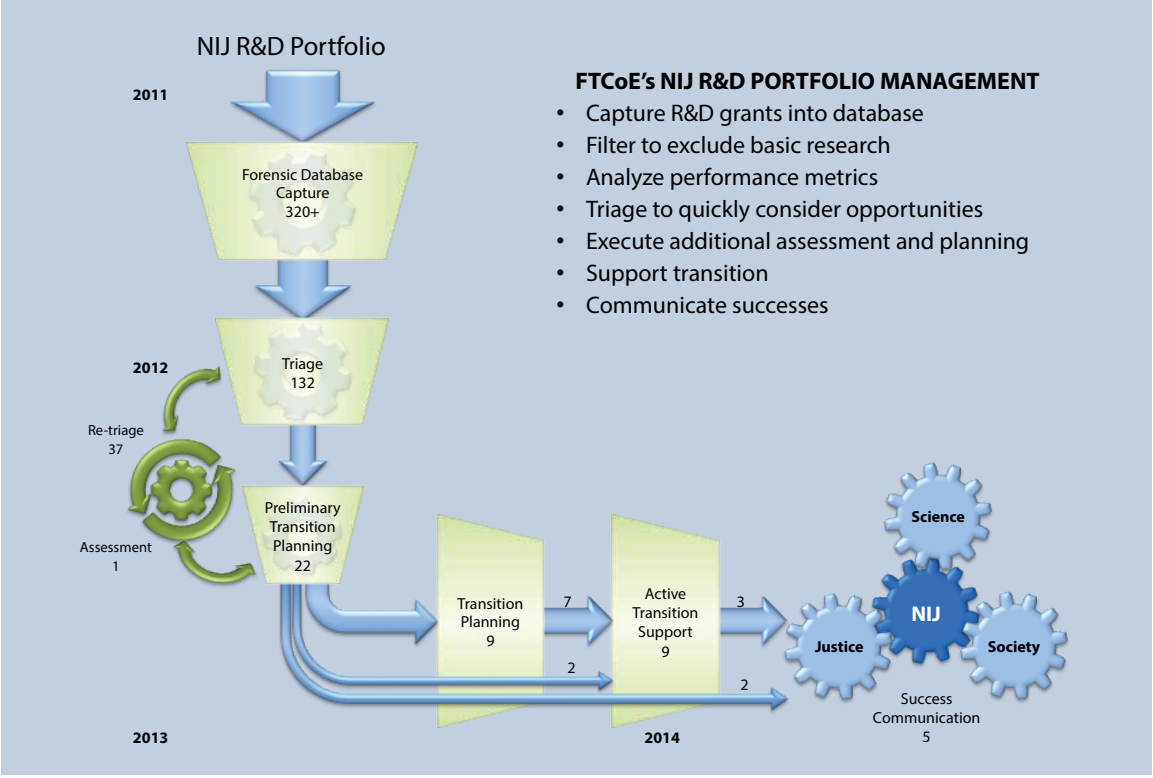
PROCESS

The FTCoE understands the breadth and value of the NIJ's investment in R&D in areas of significant interest to the criminal justice and forensic science communities. As a result, the FTCoE created a portfolio management process to capture and recognize R&D that has, or can, positively impact these communities.

Figure 2 illustrates the overall portfolio management process and presents the timeline (by year) and process steps. The figure also shows the flow of the first set of cases (NIJ R&D awards from FY2009–FY2011) to go through the process. The values in each funnel section (e.g., Forensic Database Capture, 320+; Triage, 132) represent the number of NIJ R&D grants in the set at each stage of the process. The reduction in numbers shows the winnowing that occurs as the grants move through the triage and assessment stages. In 2013, another set of R&D awards, FY2006–FY2008 and FY2012, started through the process and are currently completing the triage stage.

Each process step shown in the bullets in **Figure 2** is described in greater detail in the sections of this report. Ultimately, this process will reach more of a steady-state whereby, as grants are completed, they are considered for transition support in a timely manner.

Figure 2. NIJ's portfolio management process. Preliminary portfolio management captured and considered cases from FY2009–FY2011.



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As was explained in the December 2012 report, the purpose of the FTCoE R&D portfolio management process is to identify NIJ research "assets" that may warrant either additional research or organized technology transition support to leverage the NIJ's investment to date for impact in the broader forensic community. This effort does not evaluate the R&D projects themselves, nor does it seek to identify the best technology for a given application; rather, it focuses on the technology adoption efforts needed to successfully move a technology from the R&D laboratory to the forensic practitioner laboratory or field application.

Transition projects classified as "successful" are those NIJ-funded R&D projects that, upon completion, have transitioned the research into a relevant forensic environment, observed adoption by forensic scientists, or diffused the research into widespread use in casework analyses.

Secondary benefits of this process include

- **Improved clarity related to NIJ's R&D assets.** Identifying and highlighting R&D assets with demonstrated value in technology adoptions and the highest potential for future use/commercialization.
- **Enabling functional end-to-end systems.** Connecting stakeholders associated with a need and potential solutions and identifying practitioners that may benefit from the adoption of specific technologies/knowledge; considering and addressing where gaps in the system limit adoption/commercialization.
- **Efficient use of resources.** Focusing transition activities on R&D with the most potential for positive impact in the near-term and limiting continued NIJ investment in technologies with low potential impact. Also, assisting with sustainability of R&D products.

ACTIONS & RESULTS

Database Development, Maintenance, and Use

In 2012, at the request of NIJ, the FTCoE established a Microsoft Access (MS)–based R&D Portfolio Database for collecting, analyzing, and maintaining performance metrics on NIJ forensic R&D projects and for assessing opportunities to effectively transition forensic technologies to forensic and criminal justice practitioners. This database was developed to store information needed to describe and monitor R&D awards more efficiently, provide performance metrics, and evaluate NIJ-funded R&D projects over time. Data collected in this database include information on dissemination activities, technology transition activities to date, and future technology transition plans. The subsections below detail the development and maintenance of the database thus far.

Capture R&D Grants into Database

The FTCoE's initial step in the portfolio management effort involved the creation and maintenance of the R&D Portfolio Database. Data were first collected between October and December 2012 for 2005–2011 NIJ R&D grants. For each grant, the PIs indicated whether or not the grant had transitioned any technology, whether the grant had made an impact, and the publications/presentations to date. This information contributed to the 2012 report, *Project Update: NIJ R&D Portfolio – Performance Database and Technology Transition Assessment*. Since the publication of that report, RTI has implemented efficiency improvements within the database collection effort.

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As part of database development, original information obtained from NIJ indicated that the NIJ R&D portfolio is categorized by type of research (e.g., Applied, Basic); forensic discipline (e.g., Anthropology, Controlled Substances, Crime Scene, Digital, DNA, Fire and Arson, Entomology, Friction, Impression, Pathology, Toxicology, Trace, Question Documents, General); and grantee type (i.e., state/local, academic, non-profit, and federal). **Figure 3** summarizes the distribution of the first set of awards considered by the FTCoE by forensic discipline, with the top three represented by DNA, Friction, and Impression Evidence.

Maintenance of the FTCoE R&D Portfolio Database is actively designed to keep the database running smoothly, with the goal of achieving a well-organized, accessible format. The database is not static because changes are constantly being made as information is added, removed, and moved around. Parameters can be changed, and it is important to document these changes historically within the database records. In addition to data maintenance, routine database backups, server maintenance, change records, and other information technology (IT) measures implemented within the RTI infrastructure are maintained to ensure validity of the data.

Filter to Exclude Basic Research

The FTCoE used the R&D Portfolio Database to consider projects by research type (Applied vs. Basic/Fundamental), age, and technology area. The focus of the first portfolio management effort was the Applied research assets. **Figure 4** indicates that two-thirds of NIJ's R&D assets from 2003 to 2011 were Applied topics.

Figure 3. Captured case distribution by topic

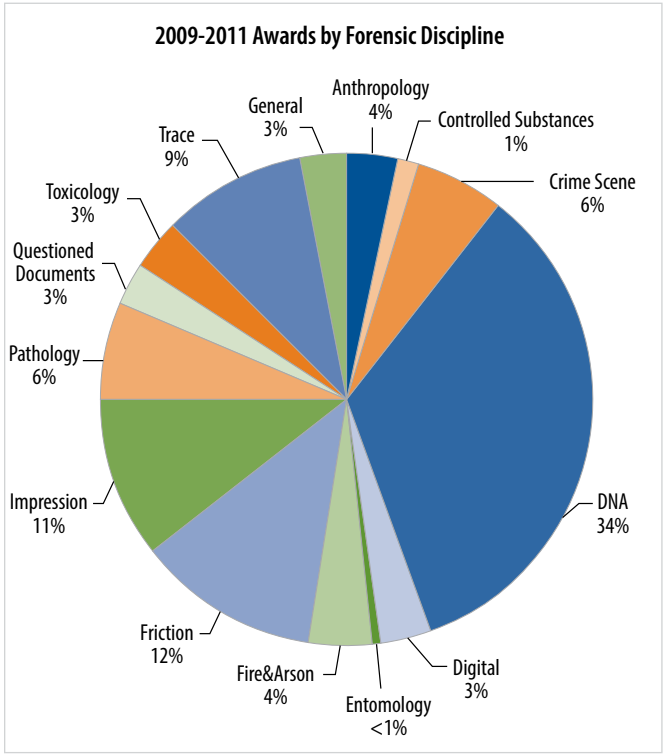
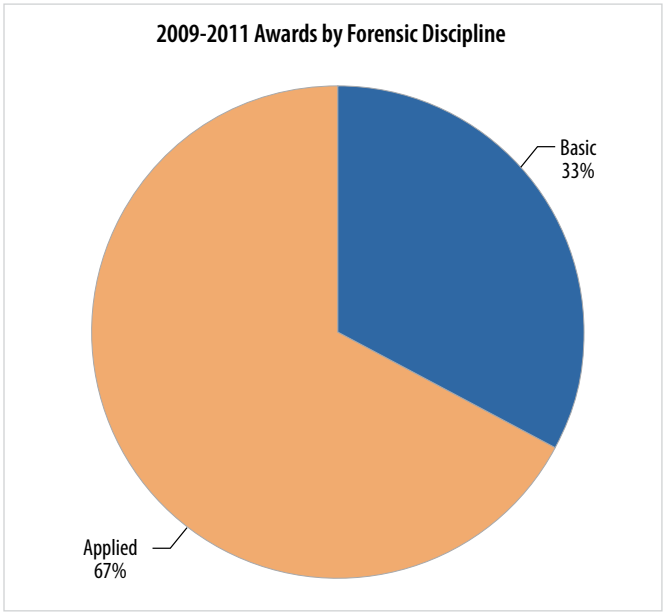


Figure 4. Cases are filtered to Applied research



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Analyze Performance Metrics

In the initial round of data collection, an automated e-mail was sent to the PI of each grant requesting that they reply and answer embedded questions about the grant status. The questions included those outlined in the text box below.

2012–2013 Data Collection Efforts

- Was a forensic technology or process successfully transitioned to law enforcement and/or the forensic sciences as a result of the funded grant project?
- Did the grant project have a use or impact that resulted from a forensic technology or process being transitioned to forensic science laboratories or the criminal justice system?
- What is the completion date (actual or expected) of the grant project?
- What citations exist related to the grant project (e.g., patent, publication, press release, presentation, other)?

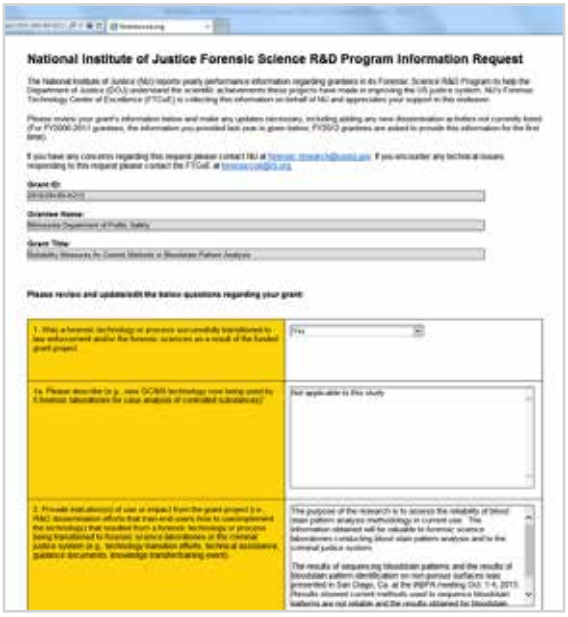
For the second round of data collection that was conducted in 2013, the following two questions were also added:

- Do you think there is potential for more technology transition activities for this project?
- Do you plan to do any more technology transition activities in the next year?

As response e-mails were received, an FTCoE staff member entered the grant information into the R&D Portfolio Database. Although this process worked well for PI response rate and compliance, there was a desire to make the process more efficient and streamlined to reduce the amount of time needed to enter data. After the publication of the 2012 report, the FTCoE created a modified approach for collecting the performance metrics.

Under the revised approach, PIs were sent a grant-specific URL (e.g., https://www.forensiccoe.org/nij_grantees/survey/grantee_number) for a dynamic webpage (see screenshot in **Figure 5**) that presented the information they provided about the grant in the previous year (if they responded) and let them confirm and/or update the grant activities that occurred in the past year using the Web-based form.

Figure 5. NIJ Forensic Science R&D Program Information Request website.



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To implement this modified approach, FTCoE staff completed the following steps:

1. Migrated the existing MS Access database to an existing FTCoE SQL Server database.
2. Populated a dynamic webpage with grant-specific information
3. Updated/developed contact materials to explain the purpose of the data collection effort, and provided instructions on how to update the information.
4. Sent a data collection e-mail to PIs for 2006–2012 grants asking them to click on the link to review/edit their information, populated in the webpage, within 1 week.
5. Sent reminder e-mails (two rounds) to non-respondents.
6. Coordinated with NIJ staff to provide data and lists of non-respondents.

This new approach streamlines the overall data collection process and provides multiple benefits. First, because a grant's performance metric information is maintained in the system, the approach reduces duplication of effort for PIs. Second, with the data migrated to a SQL Server database, the approach establishes an infrastructure to make the R&D Portfolio Database more widely accessible to other stakeholders. Third, the new approach reduces the opportunity for data entry errors because there is no secondary data entry effort. In addition, the details of the performance metrics currently being collected are enhanced beyond general numbers to include actual citations and technology transition efforts.

Finally, the system provides fast access to near real-time data and enables RTI to provide NIJ staff with requested performance metric information within a few hours; this past year, this access allowed NIJ to complete their annual data call on time and in a more efficient manner.

In 2013, the FTCoE completed a second round of data collection with PIs from R&D 2006–2012 grants using this modified data collection approach. The second round of data collection included about 20 additional grantees for which the FTCOE did not have contact information for the first round of data collection[10].

Table 1 shows the total NIJ R&D grants by fiscal year.

Table 1. NIJ R&D grants in FTCoE database by fiscal year.

Fiscal Year	Number of NIJ R&D Grants in FTCoE Database
2005	29
2006	31
2007	25
2008	52
2009	49
2010	79
2011	34
2012	35

[9] Does not include funding for Paul Coverdell Forensic Science Improvement Grants Program, DNA Backlog Reduction Program to States, Research Fellowships, or Research and Evaluation in Social Sciences. While data going back to fiscal year 2003 are included, prior to fiscal year 2007, the lists may not be complete.

[10] The same collection period and collection reminder protocol was in place for both data collections (i.e., 3 months and several email reminders for follow-up). A possible contributing factor to a lower response rate in the second round of data collection was that the PI who answered the first-year effort did not respond to the second- year effort because he/she had nothing to add. In the future, we will add a means that the PI may indicate "No updates" in response to the data collection effort, and the PI will be dropped from the data collection to next year.

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Results from all metrics contained in this database are as follows:

- **Overall response rate** – The original data collection effort for the FY2005–FY2011 grantees (data collected in fall 2012) had a response rate of 67%, with 167 grantees responding out of 249 total grantees contacted. The second round of data, which included the FY2006–FY2012 grantees (collected in fall 2013), had an overall response rate of 58%, with 156 grantees responding out of 270 grantees contacted.
- **Publications documented** – A total of 411 publications were reported by 125 responding grantees for an average of 3.2 publications per responding grantee. Responding grants had a median of 2 publications, with publications increasing over time, as shown in **Table 2**. (Note that publications where the year of publication could not be determined were excluded.)

Table 2. Publications reported by responding grantees by calendar year.

Calendar Year	Number of Presentations	Mean Number of Presentations by Awardee
2006	3	1
2007	25	2.8
2008	33	2.2
2009	34	1.9
2010	59	1.7
2011	61	1.6
2012	83	1.6
2013*	65	1.5
TOTAL	364	-

- **Presentations documented** – A total of 1,004 total presentations were given by 169 responding grantees, for an average of 6 presentations per responding grantee. Responding grants had a median of 4 presentations. Thus, for the set of PIs that responded, which are a self-selecting set, some transition via knowledge transfer had already occurred. Presentations by responding grantees have also increased over time, as shown in **Table 3** (excludes presentations where year presented could not be determined).

Table 3. Presentations given by responding grantees by calendar year.

Year	Number of Presentations	Mean Number of Presentations by Awardee by Year
2006	21	3.5
2007	60	3.5
2008	83	3.1
2009	91	2.6
2010	134	2.4
2011	233	3.1
2012	247	2.3
2013	110*	2.7

*Fewer presentations and publications in 2013 is due to data being collected prior to the end of the calendar year.

- **Transitions Documented** – Of the 91 PIs who responded, 25% (23 awardees) indicated that they had some type of successful technology transitioning of their project results (e.g., database developed and used by practitioners, implementation by one or more forensic laboratories, knowledge transfer).

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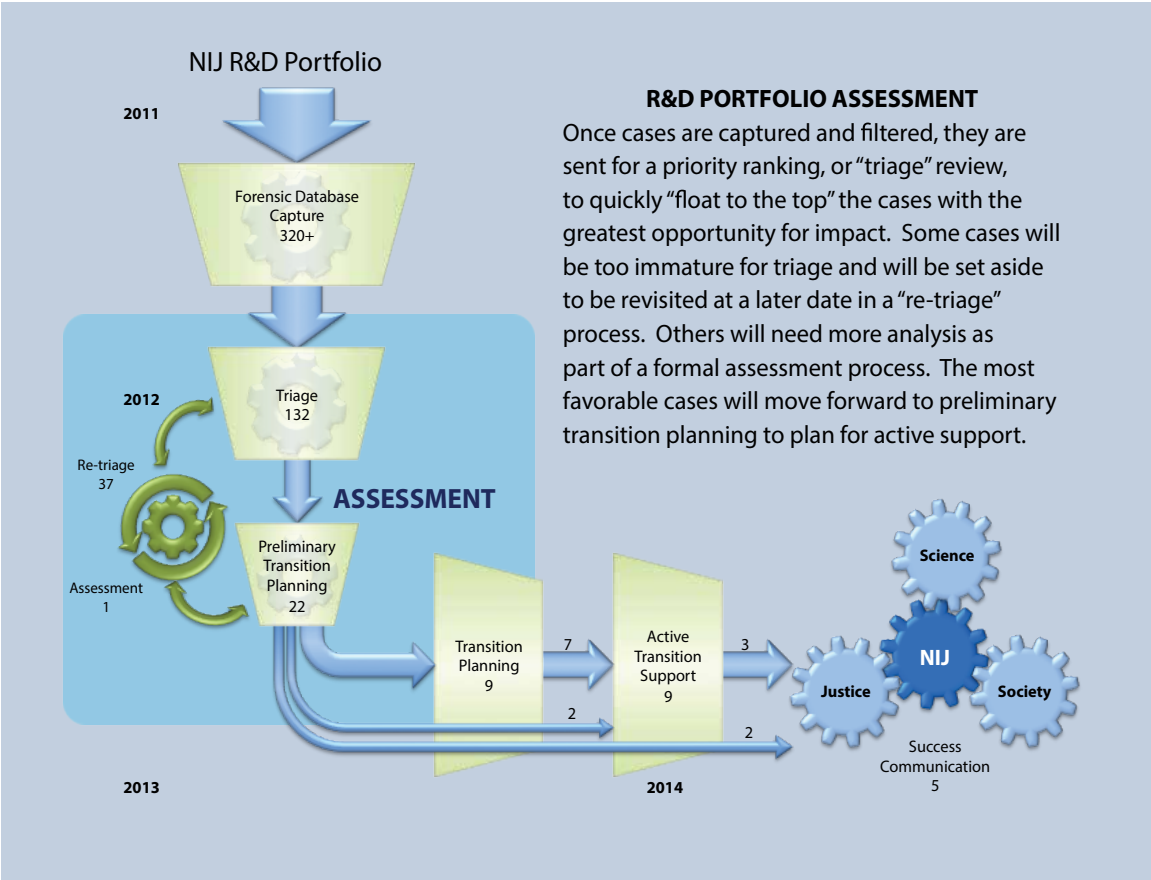
Assessment

The assessment phase of the portfolio management process uses a traditional innovation funnel as a portfolio management framework. The assessment process adds in additional expert review and opinion to continue to focus technology transfer resources on R&D that will benefit from transition support. This phase includes triage, additional assessment, and transition planning.

For early-stage R&D that is not yet mature, or that is not yet proven in forensic applications, the objective of the assessment process is to identify grants that could have a significant impact if allocated additional resources. For this early-stage R&D, the resource allocation required may be significant, but the potential impact warrants the investment of time and money for planning and support. The assessment process also reviews later-stage R&D that could have impact, such as for a niche audience or application. Typically, these efforts need a smaller amount of additional resources to complete validation or improve awareness.

Figure 6 illustrates how assessment activities (triage, additional assessment, and transition planning) downselect to R&D that will receive additional transition planning and support. The values in each funnel section represented in **Figure 6** relate to the set of 2009–2011 NIJ R&D grants.

Figure 6. The assessment phase includes triage, additional assessment, and transition planning.



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Triage to Quickly Consider Opportunities

The R&D triage process gets its name from the medical industry, where triage is used to determine the priority of patients' treatments based on the severity of their conditions. The impact of triage—and why it is commonly used by technology transfer professionals— is its ability to focus resources where they will have the most positive effect. For NIJ, the FTCoE uses triage to quickly evaluate each R&D grant for anticipated impact, transition barriers, and potential results from transition support.

To ensure efficiency, the FTCoE's triage process manages sets of awards by time period (e.g., 3 to 4 years) and disciplines. The use of triage on large R&D sets helps to quickly focus resources on those assets with the greatest potential impact. The FTCoE staff use a defined process to filter grants by the parameters outlined previously (i.e., research type, age, and technology area). Case managers are assigned cases based on appropriate technical expertise for disposition, which enables relative comparison of a topic area by one person.

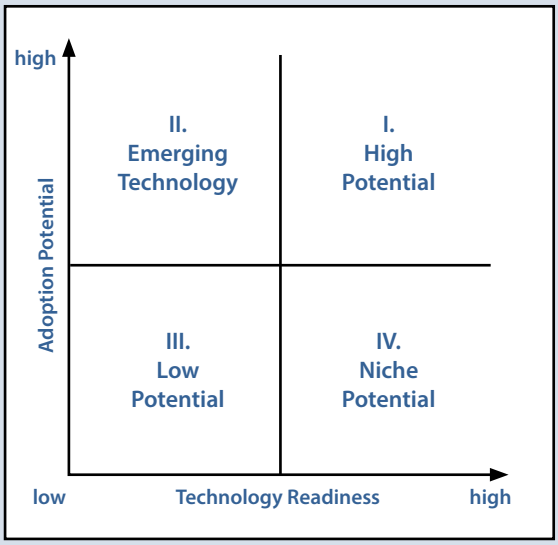
During the triage process, the case managers use RTI's standard framework (**Figure 7**) to consider each grant.

Figure 7. Framework for considering impact versus effort.

Quadrant I: *High Potential* for technology transitioning and adoption and implementation by forensic practitioners. These technologies will enhance the management of laboratory case backlogs, lower the turnaround times of evidence testing, and improve quality assurance practices. Typical recommendations for technologies in Quadrant I will be to pursue technology evaluations, knowledge transfer, technical assistance, and other adoption efforts specific to the technology or process. If applicable, commercialization and IP protection is also recommended.

Quadrant II: *Emerging Technology with Sizable Practitioner Impact*. Recommendations for technologies in Quadrant II will assess whether moving forward on the technology readiness scale (maturity) is warranted by the technology's ability to capture significant practitioner interest and willingness to adopt and use; with additional investments, technology can easily be moved to Quadrant I. Technologies in Quadrant II frequently offer opportunities to collaborate and partner with manufacturers and other forensic practitioners. If the FTCoE cannot make recommendations based on the preliminary assessment, at a minimum, key issues and barriers to technology transitioning can be identified.

Quadrant III: *Low Potential* for technology transitioning, partnership and adoption success, based on an emerging or niche technology with limited impact or unacceptable expense. A typical recommendation in Quadrant III will be not to pursue technology transitioning efforts. For technologies in this quadrant, the best case to move to Quadrant I would be to determine if further R&D or community-driven input can assist in improvements necessary to pursue practitioner adoption; however, limited impact or significant barriers do not justify the investment required in many cases.



Quadrant IV: *Niche Potential* may exist based on a developed technology in a limited forensic or criminal justice user population (limited impact). Technologies that fall in Quadrant IV are mature in the development cycle, yet do not have significant adoption potential. For these cases, the recommendation will be based on whether or not a partnership can be accomplished with limited investment, or if the technology is innovative enough to provide significant and improved results, including a reduction in case backlog or testing time. If the investment is warranted, then the recommendation can move forward.

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Each grant is given one of the three recommendations, as follows:

- **"GO"** – These are the best candidates for support. Key characteristics for "GO" projects include an enthusiastic PI; proof of user interest and the potential to meet an articulated need; the identification of logical next steps that will increase transition success; and a large potential impact in terms of the impact's significance and the number of possible adopters. The "GO" recommendation is further categorized as a High, Medium, or Low recommendation to provide a more discrete ranking within the category. The GO-High cases are the most favored. GO-Medium cases have some positive attributes, but not as many as GO-High. GO-Low cases have a significant potential upside, but may also have significant barriers to transition or less impact at targeting niche adoption.
- **"UNCERTAIN"** – Uncertain cases are grants where the research has not yet matured and, thus, the grants should be put back into the triage process (**HOLD**), or grants that require further assessment because more analysis is needed to make a decision (**ASSESS**). In 2013, grants for FY2009–FY2011 were re-triaged to determine if they could be moved into another category.
- **"LIMITED PURSUIT"** – These grants do not rise to the level of GO for various reasons, including that they do focus on a forensic technology (e.g., method of development, refinement, or validation) and, thus, do not likely warrant active transition support. For others, natural dissemination practices (i.e., publications and presentations) will be sufficient to leverage NIJ's R&D investment, so additional resources are not required.

Note that not all grants make it out of triage because they may be less mature, there may be limited information available to make a triage recommendation, or there may be a "fatal flaw," such as the PI is no longer being responsive, the barriers to adoption being too great, or the technology is proven to be ineffective or has been eclipsed. The optimization of the triage process is iterative and requires the FTCoE to continuously seek more efficient procedures and effective tools. For example, after the first triage processing, the FTCoE updated the triage templates to incorporate the use of a new Triage Portfolio Review Scoring Template, which assists with a more objective and comparative approach to triaging a set of awards. Examples of the Triage Portfolio Template and the Triage Portfolio Review Scoring Template are provided in the appendix of this report.

Triage Focused on "Technology" Grants

The following types of cases were considered a forensic technology under the triage process:

- Instrumentation/Machine (GC-MS, Raman spectroscopy, camera/scanner, sensors)
- Type of Laboratory Analysis (DNA examples: PCR, STR, Mitochondrial, Y-Chromosome)
- Software
- Databases
- Expert systems
- Management or field processes (process to reduce backlog, such as process mapping, evidence recovery process)
- Evidence collection kits
- Devices (e.g., measuring devices, tags)
- Knowledge updates for best practices (i.e., new scientific or technical findings requiring procedural changes)

The types below were not considered a forensic technology:

- Method development / validation projects
- Designs/plans
- Other types of processes

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As discussed in ***Section 2***, the first data collection effort resulted in a total of ~320 grants being captured in the R&D Portfolio Database and considered for triage. In the triage of NIJ FY2009–FY2011 awards, exclusion criteria were used to reduce the number of awards from ~320 to 132 cases. For this effort, filtering considered what qualified as a technology for this process[11] (see December 2012 report and text box on previous page) and eliminated basic research and interagency agreements. The FTCoE team then grouped the grants by topic to assign to case managers. In most cases, several topics were assigned to one case manager, except for the dominant technology topic, DNA, which was assigned to three case managers. **Table 4** shows the case clustering for the initial triage effort.

Table 4. Case clustering for efficient triage as a front-end filter*

TECHNOLOGY AREA	NUMBER OF CASES Applied and Basic Research (FY2009–FY2011)	NUMBER OF CASE MANAGERS[a]
Controlled Substances	9	1 case manager (28 cases)
Crime Scene	19	
Entomology	1	
Pathology	8	
Toxicology	17	
DNA	42	3 case managers (13 cases/case manager)
Digital	4	1 case manager (29 cases)
Fire & Arson	16	
Trace	33	
Impression	24	1 case manager (16 cases)
Question Documents	7	
Anthropology	29	1 case manager (31 cases)
Friction	30	
Trace	4	

Note: Basic research and Interagency Agreement Awards were removed from the FY2009–FY2011 triage process. The number of cases assigned to case managers is slightly higher than the total indicated (143 versus 132 awards) because 11 Basic research awards were randomly assigned to the triage process to determine how the transition readiness of these awards compared to Applied research awards. In all but one case, Basic awards were reviewed and recommended as having lower potential for transitioning. Often times, this was due to the maturity of research (i.e., critical research questions still required before ready for adoption).

[11] Technology is the development, modification, usage, and knowledge of tools, machines/instruments, systems (e.g., database), and methods of organization (e.g., software, expert systems) in order to solve a problem, improve a preexisting solution to a problem, achieve a goal, or perform a specific function.

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Table 5. Summary of the results of the initial triage assessment, categorized by forensic discipline.

TOPIC	TOTAL	GO			UNCERTAIN		Limited Pursuit
		High	Med	Low	Hold	Assess	
Anthropology	7		1		1	1	4
Controlled Substances	3				1	1	1
Crime Scene	10		2		4		4
DNA	42	1	6	2	6	5	22
Entomology	1						1
Fire and Arson	2	2			2		3
Friction Ridge	13	1	3			3	6
General Forensics	2					1	1
Impression	12				6	1	5
Pathology	4		1				3
Questioned Documents	4				1	1	2
Toxicology	2	1					1
Trace	21	2			2	1	16
TOTALS	132	7	13	2	23	14	73

Using the process discussed earlier in this section, case managers reviewed the FY2009–FY2011 cases and gave each case a recommendation (i.e., GO, Uncertain, or Limited Pursuit). Once all cases were rated, the group of case managers convened, with the addition of a few selected subject matter experts (SMEs), to consider the ratings collectively. Each case manager presented his or her group of cases and advocated for the "GO" selections. The group asked questions and considered the relative impact of all of the "GO" cases across the portfolio. By bringing varied perspectives, this collective approach brings the group case management back to the portfolio level and strengthens the analysis of each case.

Execute Additional Assessment and Planning

As shown in the totals of the GO columns in **Table 5** (green columns), at the conclusion of the triage process, 22 cases entered an additional assessment process to confirm potential and begin to plan for transition. These cases were assigned to a case manager (often different from the triage case manager) who was provided with information from the triage, and a Preliminary Transition Planning Template (found in the appendix of this report) to guide his/her thinking and to assist with driving common analysis and results.

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Using the template, the reviewers follow the process outlined below to conduct the additional assessment, which in effect also starts the preliminary transition planning:

1. Review documentation (e.g., the Triage Report and other materials).
2. Contact the PI. Consider the PI's thoughts on transition success to date, barriers, and if support could move the R&D toward impact for the forensic community.
3. Conduct primary[12] and secondary research[13] to recommend a transition strategy that might include one of the following (note that reviewers are familiar with these recommendation options):
   - Knowledge Transfer – Conducted via roundtable, training event, publications
   - Commercialization – Conducted via licensing, joint-venture, supply chain partnership, etc.
   - Strategic Alliance – Used for development or other transition benefit
   - Documentation of Transitioning Success – Used to show where PI can demonstrate use in community, track details
   - No Further Action – Indicates that PI is not interested, or other insurmountable barriers exist
   - Other – Indicates inadequate information; outlines other recommendations.
4. Document findings and recommendations.
5. Meet as a group to discuss cases.

During every part of the assessment phase, the filtering process continues as finite resources are considered across cases. For each of the 22 cases, the FTCoE completed a Preliminary Transition Case Report using the above process.

Table 6 presents the results of this additional assessment (i.e., preliminary transition planning) of the 22 FY2009–FY2011 grants that moved forward from triage. This additional assessment continued to reduce the number of cases, with only 9 of the 22 cases proceeding to the Active Transition Support portion of the portfolio management process.

Table 6. Preliminary transition planning case disposition results.

Transition Recommendation	YES	NO	UNCERTAIN	
			MAYBE	WAIT
Crime Scene	2			
DNA	3	3	2	1
Fire and Arson	1		1	
Friction Ridge	1	1	2	
Pathology (Autopsy)				2
Toxicology (Cheminformatics)	1			
Trace (Pigment)	1		1	
TOTALS	9	4	7	3

[12] Primary research includes discussions with thought leaders, market players, and Technology Working Group and Scientific Working Group representatives to gain input on the benefits, challenges, and ultimate opinion on the potential for the R&D asset. Primary research is typically in the form of scheduled phone interviews, but may also include face-to-face meetings.

[13] Secondary research includes review of sources such as academic literature, trade publications, presentations, and web-based sources.

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Support Transition

At this point in the portfolio management process, the focus shifts to active support, which inherently includes documentation of plans needed to align resources, including support teams and budgets. As stated previously, the ultimate goal of the R&D portfolio management process is to quickly and efficiently highlight cases that can benefit from additional resources and support to leverage NIJ's investment. The analysis is not intended to be completely thorough for every asset, but instead is intended to bring additional resources to situations for which support is warranted. Building from the work completed and document in the Preliminary Transition Case Reports, planning continues to determine how each grant might benefit from FTCoE support, including

- Working to make a commercial entity aware of NIJ-funded R&D and the associated market need to enable a market supplier
- Connecting researchers to testing and validation partners
- Communicating about available "do-it-yourself" solutions.

Finalizing the Transition Plan

At this stage, a Technology Transition Plan is completed for each case (an example of this template is provided in the appendix of this report). This document is a succinct record of the transition activities and is continuously updated; as such, it is maintained as a "living document." For the NIJ R&D FY2009–FY2011 set, Technology Transition Plans have been completed for the remaining nine grants, and are currently being used to guide forward progress via support efforts.

Each Transition Plan documents the following variables:

- **Transition Readiness Level (TRL)** – The FTCoE has revised the much-used TRL scale to reflect the realities of technology development for the forensics community. TRL is used to rank level of maturity and is one variable in considering the challenges associated with transition. The FTCoE TRL scale adapts these metrics to forensic applications to assist researchers, practitioners, and other stakeholders in the assessment of new technologies within this unique sector.

  Researchers and stakeholders are encouraged to study the TRL scale to improve their understanding of the full range of work that is required for a promising technology to transcend research and move into practice. FTCoE Technology Transition Plans align with this TRL scale by defining the activities needed for specific technologies to graduate to higher TRL levels and, eventually, into widespread adoption. **Table 7**, on the following page, presents the FTCOE TRL scale.

- **Transition approach** – A transition approach is built from various transition support options (see **Figure 8** on page 21). Cases can have more than one transition approach that is appropriate and/or recommended. For example, a combination of an active transition effort and Success Story documentation (see below) may be necessary to drive knowledge transfer of the applicability and details on use of a technology. Information on commercial products that are available via successful marketing may also help drive adoption.

- **Estimated time to implement the Transition Plan** – This information captures the anticipated duration of an effort based on the amount of transition support, additional research and testing, and other factors (e.g., PI availability, FTCoE transition, funding).

- **Management team** – Indicates those individuals/organizations committed to driving adoption.

- **Current partners**– Documents status of partnerships.

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- **Potential partners** – Documents thinking on appropriate partnerships.
- **Target user communities** – Considers where users might benefit from adoption and encourages complete thinking beyond the first and most obvious group.
- **Intellectual property (IP) management** – Documents any known or potential issues related to IP in terms of issued patents, pending applications, lapsed efforts, ownership, public domain, etc., that may be germane to transition efforts.
- **Manufacturing /scalability/knowledge transfer** – Considers issues related to scale up, production, and other realities of bringing a physical solution to users.
- **Funding requirements for plan execution** – Brings forward level of effort and expense estimates for consideration of cost/benefit for transition efforts.
- **Other requirements to stand up technology** – Reviews extra considerations that might be unique and need to be documented.

Table 7. The TRL scale helps communicate the maturity level of a technology and assists with consideration of appropriate transition support.

TRL	Description
1	Basic scientific principles are developed, observed, and reported.
2	The concept has been developed into a process or physical technology. Potential applications, markets, and existing competitive technologies/products/methods can be considered.
3	Critical experimental function or proof-of-concept has been demonstrated. A more developed understanding of potential applications, technology use cases, and user requirements/constraints, and a familiarity with competitive methods, technologies, and products, allows for initial consideration of adoption by users. Possible transition paths are identified and may be iteratively refined based on data from further technology and user analysis.
4	Experimental technology has been tested and proven in the research laboratory. The technology or process has been integrated into a working system that can be used in controlled conditions.
5	The technology system is developed into a prototype hardware or process that is demonstrated in a relevant environment. The needs and views of potential end-users align with the capabilities of the technology, including an initial assessment of cost-benefit, market analysis, and manufacturing considerations. Any certification or regulatory requirements or process are identified.
6	The process or technology product has been tested and validated in an operational environment (crime lab or field). A deep understanding of the target application and market is achieved, and the product is defined. Comprehensive commercialization or technology transition plans have been developed and are under way. Product outputs are validated with respect to real or model forensic samples, in accordance with Daubert or other legal standards.
7	The product has been deployed and proven through successful mission operations (crime lab or field). The product is available commercially or can be adopted into practice through readily accessible guides, training, or databases. Police end users have completed operational test and evaluation to identify the outputs of the technology. Independent research and evaluation is defined to determine the impact on policy, practice, and mission outcomes. Validation, certification, and regulatory requirements for the product are well understood, and appropriate steps for compliance in practice are under way.
8	All stakeholders are engaged in product/process qualifications. Outcome evaluations have been completed to guide adoption. All necessary validation, certifications, and/or regulatory compliance are accommodated.
9	The product has attained large-scale adoption within the forensic community and complies with all relevant legal and regulatory standards. Users have access to training or other information to use the product and ensure that the field maintains an appropriate level of practitioner expertise. Product refinements occur within the commercial or practitioner communities without significant external research and development.

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Transition Support Options

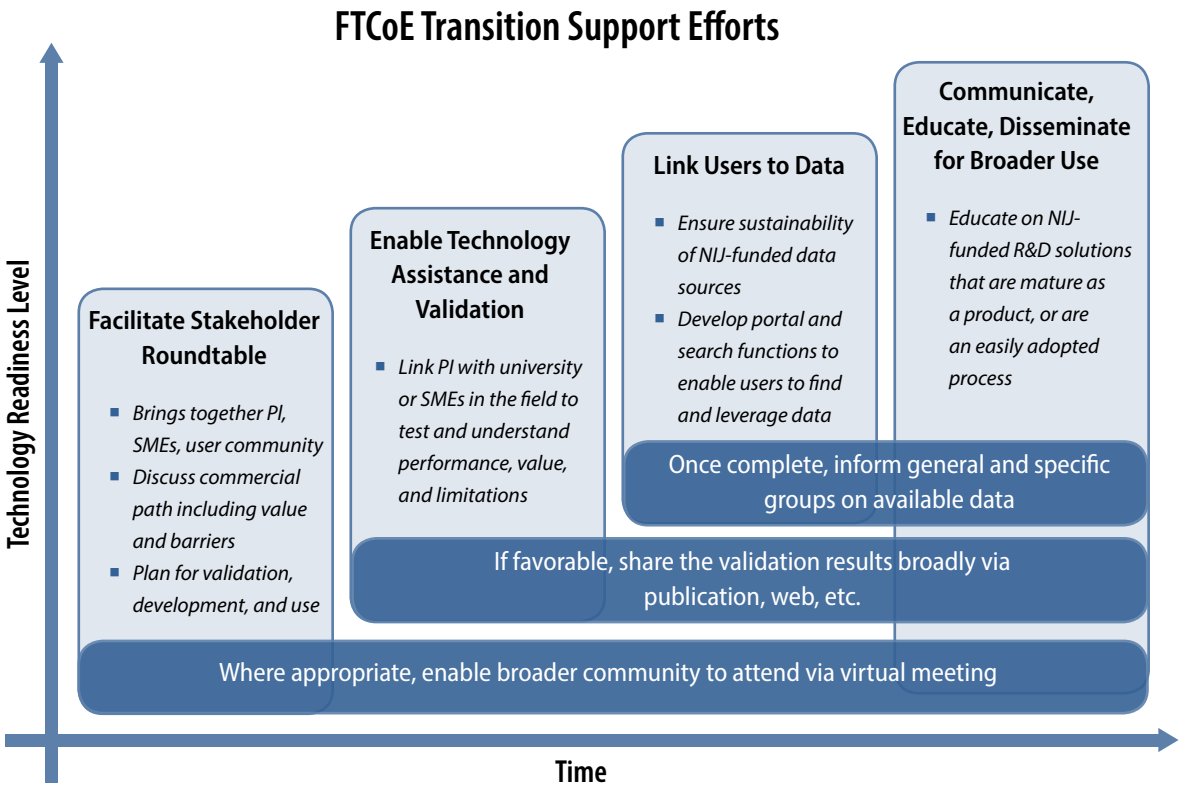
Transition support is used to accelerate end-user implementation of new forensic technologies and methods. **Figure 8** presents the types of transition support efforts as discrete categories based on TRL and along a time continuum. Most efforts involve some level of communication, although communication about successful technologies is also important as knowledge transfer that drives continued adoption. Support options are chosen based on the technology readiness, and whether the end goal is to enable products, inform the field, and/or document success.

For each case, the FTCoE transition team moves forward with one or more of the following actions:

- **Facilitate Stakeholder Roundtable** – The goal of the Stakeholder Roundtable is to enable a community-type planning process for needed development and validation, as well as to define who will do what (stakeholders beyond the FTCoE) and when. The Stakeholder Roundtable allows commercial suppliers or various stakeholders to consider a grant's results or protocols, as well as the ultimate adoption of a technology. The roundtable accelerates the process by bringing together interested parties to plan for partnerships and progress. This forum is an excellent early "litmus test" of a project; for example, if a stakeholder forum is planned, and stakeholders are not interested in supporting it (e.g., investing time and travel), the potential benefits of the transition project may not warrant investment in the effort.

  A Virtual Roundtable adds the option for a broader forensics community to watch the discussion virtually via the Internet.

Figure 8. Technology transition support helps technologies reach broader use via commercialization and/or knowledge transfer.



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Functionally, this format allows a larger audience to witness a discussion of selected SMEs, and enables SMEs some interface with the virtual audience in the form of questions and comments. This is a good tool for projects that need the stakeholder community (e.g., PI, market players, policy experts, users) to discuss the opportunity, but where a broader audience might gain from watching the discussion to influence their own thinking related to adoption.

Examples of Virtual Roundtables conducted by the FTCoE in 2013 are shown in the text box to the right. Note that not all roundtables facilitated by the FTCoE to date resulted from the R&D portfolio management process. Because the R&D portfolio management process was being developed, the FTCoE was supporting efforts brought forward for transition support based on FTCoE and NIJ selection.

- **Enable technology assistance/validation –** Some transition efforts are based on a given set of equipment or transfer that is related to hands-on activities or demonstrations. For these cases, the goal is to facilitate a meeting whereby participants can watch a demonstration or bring samples for validation. Similarly, in limited cases, the effort may support a PI going to a practitioner's laboratory to assist with technology set-up and implementation. Enabling this type of real-time, collective user-community experience can assist with transfer and provide critical feedback to PIs to influence their future research and/or refinement.
- **Link users to data –** This transition effort develops portal and search functions to enable users to find and leverage NIJ data to ensure the sustainability of NIJ-funded data sources. Where appropriate, the FTCoE is working to consider how to better collect and "amplify" use of datasets to enable long-term or sustainable access, versus research funding that creates data that cannot be accessed broadly or beyond some limited funding window.
- **Communicate, educate, disseminate, for broader use –** As illustrated previously in **Figure 7**, all of the aforementioned support efforts include elements of communication. For example, a Stakeholder Roundtable may be made available to a wide audience via Web-based streaming. This allows for the broader community to be aware of emerging research and for a facilitated discussion that may help users offer insight or start to consider future adoption. With technology assistance and validation, if the results of the testing are positive, they may be shared more broadly. Similarly, once databases are complete and enabled for increased use via a portal, their availability needs to be communicated to improve awareness and drive for user adoption. In effect, all elements of transition support should eventually touch on communication and knowledge transfer to inform the field. The ultimate goal is to share

FTCOE Virtual Roundtables in 2013

Example topics supported by FTCoE technology transitioning efforts include the following four meetings, which resulted in more than 2,300 practitioners receiving valuable information by having virtual access to early adopters of a technology:

- *Advanced Medical Imaging in Medicolegal Death Investigation* (924 registrants)
- *Applications of Higher Resolution Mass Spectrometry in Drug Testing* (676 registrants)
- *Using Genetic Results to Identify Human Remains* (531 registrants)
- *Gaining Speed with "Fast GC"* (150 registrants)

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results so that others can build on the R&D investment made by NIJ.

Another method that might be selected for this type of knowledge transfer is use of a webinar. Webinars can be used to educate on the use of new technologies or the adaptation of existing technologies to enhance effectiveness, efficiency, and safety within criminal justice agencies and forensic laboratories to improve overall operations. Webinars provide a cost-effective opportunity to transfer knowledge to a large audience. The FTCoE has hosted webinars to provide technical assistance and educational instruction to state and local agencies, as highlighted in the text box to the right.

FTCOE Webinars in 2013

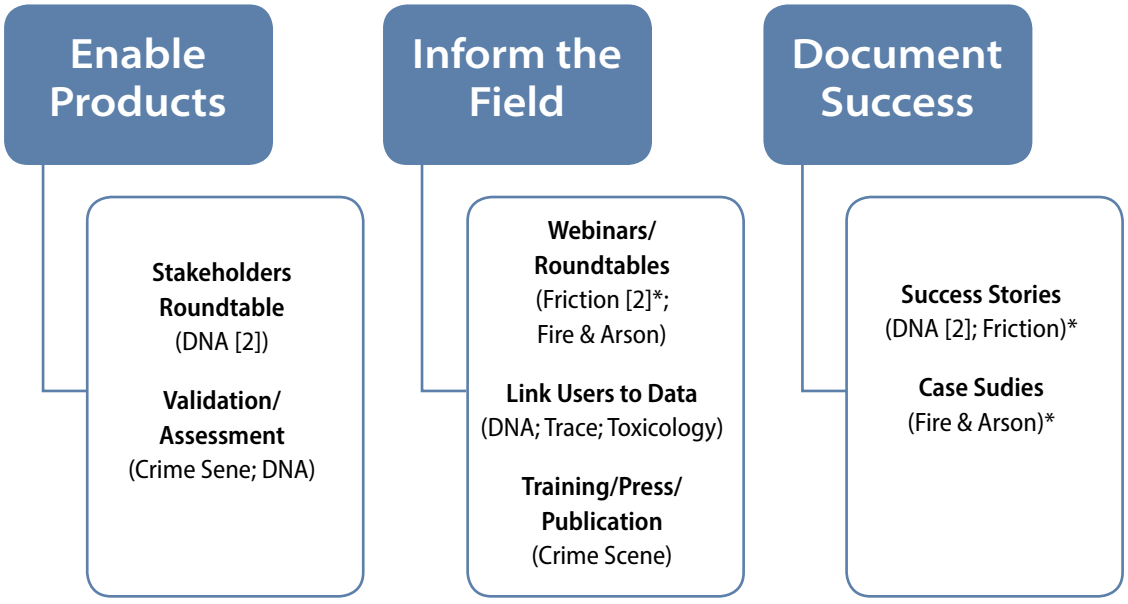
Example topics supported by FTCoE technology transitioning efforts include the following three webinars, which resulted nearly 3,500 practitioners receiving valuable information from early adopters and researchers of a technology:

- *NIJ R&D Research Series* – 8 webinars (2312 registrants)
- *Human Identification in Mass Fatality Incidents* (676 registrants)
- *Impression and Pattern Evidence Workshop Series* (459 registrants)

Transition Support for FY2009–FY2011 NIJ R&D Awards

At present, 9 cases are still in active support. **Figure 9** shows various FTCoE support efforts based on the goals of the portfolio management process. Some cases (those noted with *) were selected by the FTCoE and NIJ outside the R&D process, but fit within the framework. The 9 cases that came through the R&D portfolio management process include the following topics: Arson (1), Crime Scene (2), Data (3), and DNA (3). Some of these cases may still fall away as transition support moves forward and as barriers are better understood. However, all of these are believed to warrant the additional support to increase the likelihood that NIJ's R&D investment can have greater impact for the forensic community.

Figure 9. Existing FTCoE transition support cases.



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Analysis of 22 Triage "GO" Cases through Preliminary Planning to Support

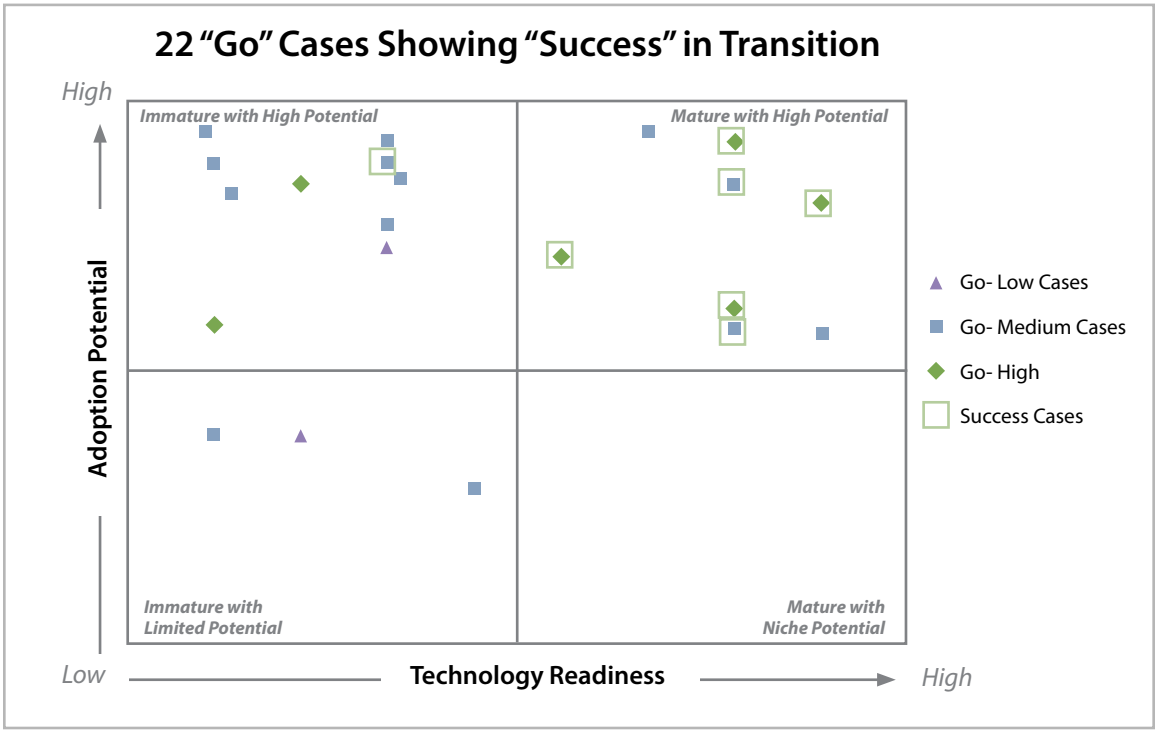
One way to better understand the R&D portfolio planning process is to consider decisions being made at different stages (i.e., triage, assessment, planning). As explained in ***Section 3.2.1***, the triage process resulted in 22 "Go" cases that were ranked as High, Medium, and Low. Each of these cases garnered additional assessment and planning, as described in ***Section 3.2.2***. The first step in this assessment was to interview each PI to update the status of the case, as well as to consider what transition successes had already occurred and where additional support might lead to greater adoption impact.

Figure 10 presents a graphical representation of the 22 "Go" cases and their estimated placement on the "quad framework" presented as **Figure 7**. In many cases, the PI interview documented existing transition success, which is represented with a green box around each "success" case.

Successes ranged from broad public dissemination of results/methods to commercially available products.

Most of the success cases are located in the upper right quadrant—indicating they are more mature and offer greater potential impact to the community via adoption. It is important to note that in some cases, the documented success resulted in a decision that the case did not warrant additional technology transition support. In many of these cases, the FTCoE has started support for broader dissemination of these successes and plans to release them publicly upon approval by NIJ. One example format is a one-page flier; another is the use of webinars, such as the one completed for the Ace-V fingerprint process. In both instances, the FTCoE further highlights how these technologies were successfully transitioned from R&D efforts to implementation and use by the practitioner community.

Figure 10. "Go" triage cases mapped to quad framework.



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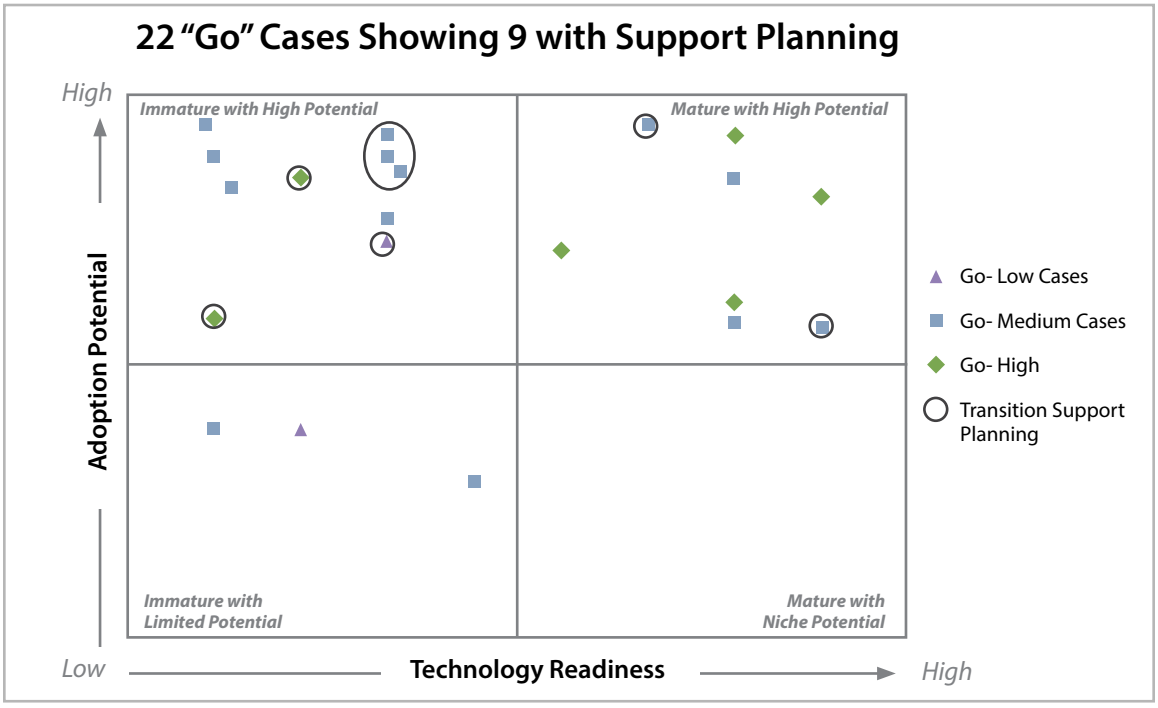
Of the 22 cases, 9 were slated for additional planning and support. **Figure 11** plots these cases on the quad framework. As might be expected, many of these are in the upper-left quadrant. This is logical because these cases have a high potential impact via adoption, but are less mature. Transition support may be able to help shift the cases to the right, with specific support that will increase the readiness level. In total, 15 of the 22 cases that moved from triage to planning have received, or are in process to receive, transition support that includes touting a success and/or driving to adoption.

By studying **Figures 10 and 11**, some key trends emerge:

- **Upper right quadrant *(Mature with high potential)*** – All cases have either a success noted or transition support planned. This illustrates the fact that mature cases with high potential adoption impact should either be touted as successes or pushed to greater impact.
- **Upper left quadrant *(Immature with high potential)*** – Most of the cases that are more mature (farther right) have transition support being planned. This planning is to consider the best way to move the cases right, and up, and to gain the greatest impact. The one case that is between the circles was abandoned by the company developing it, thus leaving it at as an orphan technology, and in a position to which, presently, it is difficult for the FTCoE to provide assistance.
- **Lower left quadrant *(Immature with limited potential)*** – None of these cases garnered planning because, during assessment, each was found to have cost or market barriers. These may be overcome, which would likely have an associated increase in adoption impact and technology maturity.
- **Lower right quadrant *(Mature with niche potential)*** – No cases fell in this quadrant. Typically, cases in this quadrant warrant some level of support because the case has a high technology readiness and can be transitioned to a specific niche application.

Figure 11. "Go" Triage Cases Highlighting Support Selection



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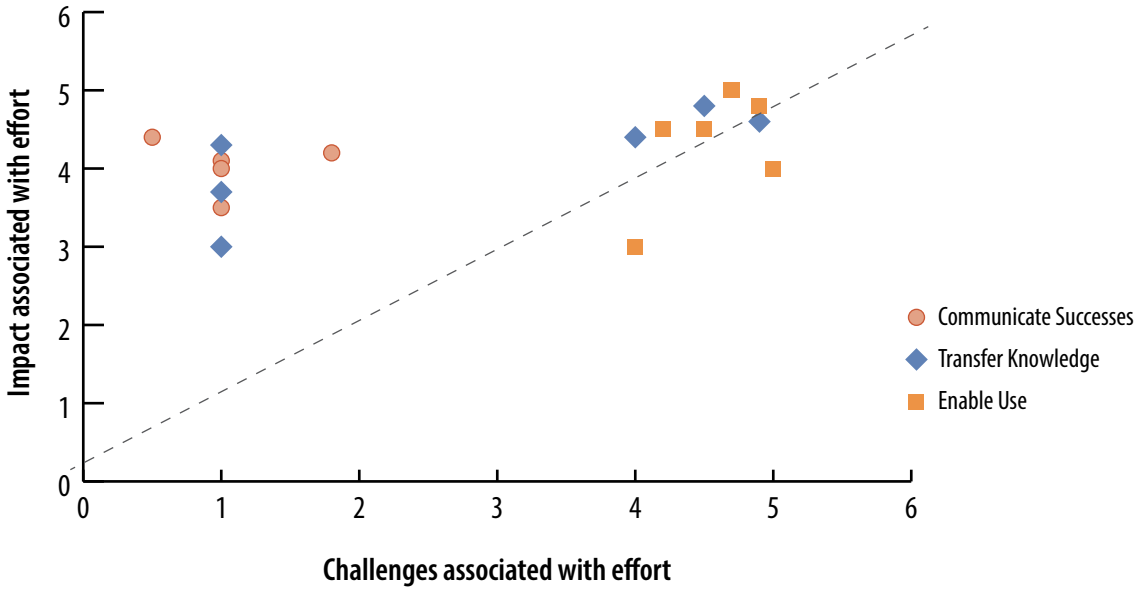
Cost/Benefit Consideration for Support Options

Because the FTCoE is not just executing a process, but also helping to develop and optimize it, the Center did a cursory cost/benefit comparison on the FY2009–FY2011 cases based on their transition approaches (as outlined in the Preliminary Transition Plans). The cases going to complete transition support were rated on potential impact and level of difficulty (i.e., challenge ranking). The impact considered a project's ability to improve efficiency, reduce costs, and address the backlog issues that plague crime laboratories. The challenge ranking considered difficulties in persuading the forensics community to implement the technology and the challenges of working effectively with the investigator and potential partners.

The graph in **Figure 12** illustrates the transition approaches using the first group of cases as pilot data and considers the cost/benefit tradeoff for various types of efforts. As would be expected, efforts related to communicating success (●) are not difficult and can have a solid impact in terms of education and communication that can lead to increased adoption. Knowledge transfer (◆) efforts that are similar to efforts related to communicating success (three blue diamonds clustered in the red squares) relate to technology demonstration, webinars, and other transfer efforts on the education end of the spectrum. Knowledge transfer efforts that are closer to tasks trying to enable use (■) relate to data-centric technologies, including databases. These latter efforts have higher impact and greater associated challenges.

This graph represents only the first wave of cases, yet the trends align with logical expectations. Also, the fact that there are no challenging but low-impact cases plotted is because of the filtering that has occurred prior to selection of the final group.

Figure 12. Cost/benefit consideration for various support efforts.



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Communicate Successes

Documentation and communication of successes provides multiple benefits to successful transition of NIJ-funded R&D to application:

- The user community becomes aware of products, data resources, and other knowledge that they can leverage to improve operations.
- NIJ becomes aware of the impact of R&D funding to inform future investment.
- The FTCoE gains best practices and lessons learned to inform future transition efforts into the forensics community.

Two ways that the FTCoE is formally documenting successes are through the creation of Success Stories and case studies. Success Stories use print and online media to tout successful transition of NIJ-funded R&D and the associated impact using the Web or at professional conferences and technical workshops. Case studies are used to consider the process and to document learnings for NIJ. These documents analyze the situation, barriers, support, and outcome of successes to inform future efforts and transition models.

BEYOND THE PROCESS

For the FY2009–FY2011 awards, the FTCoE portfolio management process can now shift to a steady-state focus of measuring and maintaining the technology transition readiness of awards. However, in addition to progress with the R&D portfolio management, it is imperative that the FTCoE continue to streamline and enhance the process, as well as seek opportunities to assist with technology evaluations and technology adoption and implementation by forensic laboratories and criminal justice agencies. In parallel to this ongoing R&D portfolio management effort, the FTCoE continues to support other technology adoption activities that go beyond this process.

Because the FTCoE's assessment and portfolio management was ongoing in 2012 and 2013, transition planning was determined largely on NIJ and community input. A report of the FTCoE executive summary of activities for the January 1, 2012, to November 13, 2013, performance period can be downloaded from the FTCoE website (https://rti.connectsolutions.com/p9mcvzui0w8/). This summary serves as a documented outline of the most significant forensic technology–focused FTCoE projects, milestones, and achievements to date.

During this period, the FTCoE has been able to disseminate funded research and deliver technology assistance and Web-based technology transfer workshops to more than 10,000 registered practitioners. In addition, the FTCoE continues to support the General Forensics and DNA Technology Working Groups, as well as various Scientific Working Groups and Forensic Science and Criminal Justice Professional organizations, by hosting onsite and online meetings. Finally, the FTCoE evaluated 8 new technologies; sponsored 6 technology transfer events, including hands-on workshops; supported outreach to 42 events; and made 19 presentations on technology to the criminal justice and forensic communities.

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SUMMARY

To date, the FTCOE has collected performance metrics and developed and performed a multi-phase portfolio assessment and management process for over 400 NIJ R&D awards. Thus far, the FTCOE has focused resources on 9 grants for which it is planning a myriad of transition and adoption efforts during 2014 and beyond. These transition plans were created with input from the PIs and will include collaborative efforts with PIs and other practitioners and stakeholders.

The FTCoE will continue to work with NIJ's investment in R&D to improve a process to facilitate technology adoption and impact criminal justice operations in a positive manner. This process will continue to identify NIJ research "assets" and disseminate them to the broader forensic community. The ultimate goal is to enable products, inform the field, and communicate success to bring understanding and value to the forensics user community and more broadly, including science, justice, and society.

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APPENDIX

The following provides examples of project templates referenced in this document.

Triage Portfolio Review Template

NIJ Technology Triage Portfolio Review

Evaluated By:
Date:

Grantee/Award Number(s) and Title(s):
Principal Investigator Name(s):
Discipline:
Applied/Basic:
Final Report URL (no report available if blank)**:**

Abstract:

Publications/Presentations:

IP Status:
- ☐ Published in peer-reviewed journal (publication date:)
- ☐ Enabling public disclosure via paper, presentation, website, other (disclosure date:)
- ☐ Patent issued (patent no:)
- ☐ Patent filed (file date:)
- ☐ Provisional filed (file date:)
- ☐ No patent(s)

Type of Technology: ☐ Instrumentation/Machine ☐ Laboratory Analysis ☐ Software ☐ Database ☐ Expert Systems ☐ Product (Kits, Markers) ☐ Devices (e.g., measuring devices, tags) ☐ Knowledge Updates for Best Practices ☐ Management or Field Process
Other/Comment: _____

No Technology Category: ☐ Method Development ☐ Validation/Optimization ☐ Techniques ☐ Designs/Plans ☐ Other Types of Processes
Other/Comment: _____

Brief Description of Technology:

Application:
☐ Field ☐ Laboratory ☐ Both Statistical Analysis: ☐ Yes ☐ No

Summary Recommendation (check one of 1-3)
1. ☐ **"GO"** - Proceed with defining future technology transition efforts (if checked, please rate strength of recommendation): ☐ Low ☐ Med ☐ High
2. ☐ **"LIMITED PURSUIT"** – Little to no FTCoE transition assistance required, no transition plan created

☐ **"UNCERTAIN"** – Need for greater understanding and assessment (if checked, please clarify): ☐ Move to assessment ☐ Hold and revisit in 1 year

Rationale:

Decision Factors (check all that apply)

Positive	Negative
☐ Research timeline matches adoption timeline	☐ Technology needs significant development
☐ Beta-level use by crime labs or field units	☐ Previous transition not successful
☐ Knowledge would be easy to disseminate	☐ Likely limited demand or impact
☐ Technology appears to be novel	☐ Alternatives are readily available
☐ PI is a champion	☐ Technology is not novel
☐ NDAs in place with companies	☐ Legal issues limit adoption
☐ Prototypes developed	☐ Other IP issues may exist
☐ IP asset exists	☐ Statutory bar date may exist
☐ Other (explain)	☐ Other (explain)

Comments:

Brief Description of Funding Priority:

Brief Impact Estimate

Potential user community size.
- ☐ Large: most crime labs and/or other forensic service providers and forensic practitioners
- ☐ Intermediate: some crime labs and/or other forensic service providers and forensic practitioners
- ☐ Niche: very limited number of specialized criminal justice community users

Ability to economically reduce crime lab backlog/forensic service provider caseload.
- ☐ Significant: inexpensive solution with high potential to reduce backlog
- ☐ Intermediate: expensive solution with high potential to reduce backlog
- ☐ Limited: expensive and limited impact on backlog likely

Fill in the following if known:

Benefits/Features:
Competitive products & technologies:
Barriers to entry:
Possible applications:

Quadrant Placement:

PI Contact: ☐ Yes ☐ No

Principal Investigator Contact Record

PI: **Title:**

Organization:

Phone: **Fax:** **Email:**

Date:

Following is a list of questions that can be used for plan purposes. DO NOT use these as an interview script. During PI contact, you will NOT need to touch on all issues, be responsive to answers and revise accordingly. Remove this section if an interview was not performed. If an interview was performed, delete all questions and information that was not included in the interview.

1. Can you describe the novel aspects of the research that enable greatest impact to the forensic community?
2. Has there been any enabling public disclosure related to the research?
3. Has there been additional research since the NIJ funded effort?
4. What is the development stage? Concept- experimental- prototype?
   - ☐ TML 1: Basic (scientific) principles have been observed and reported
   - ☐ TML 2: Technology concept and application have been formulated
   - ☐ TML 3: Critical experimental function or proof-of-concept has been demonstrated
   - ☐ TML 4: Experimental technology or system has been tested and validated in the lab
   - ☐ TML 5: Actual technology has been demonstrated in a relevant environment
   - ☐ TML 6: Actual technology has been tested and validated in an operational environment (crime lab or field)
   - ☐ TML 7: Actual system has been proven through successful mission operations (crime lab or field)
5. Have you done anything to transition the research to application?
6. Have you done anything to protect any intellectual property?
7. How does technology in the current development state compare with state-of-the-art?
8. What else must be done before it is ready for application in forensic settings?
9. Can you think of any barriers to adoption?
10. Are there partners needed to work toward application and adoption?
11. Who in the forensic community would benefit and how?
12. How well does it fit with existing practices? How easy will adoption/implementation be within forensic settings?
13. Are there non-forensic applications that could help with transition (e.g., existing vendors, proof of concept)?
14. Can you think of other potential applications that might enable this "dual-use" benefit for transition?
15. Have you published or do you plan to publish this research?
16. Have you spoken with any companies? Contacts? Can you suggest other contacts that might provide perspective and understanding on the issue/need and value of this technology or potential alternative solutions?

Triage Portfolio Review Scoring Template

PI/ NIJ Award Number:
Date:
Evaluator:

NIJ Forensic Technology Center of Excellence

Triage Scoring Matrix

GOAL—place technology into one of the following three categories:

- *Low Priority – barriers for technology transition and evaluation appear to be significant, not recommended for transfer efforts*
- *Medium Priority – potential transition issues/hurdles are identified; recommended for further evaluation only if budget/time allow after high priority technologies*
- *High Priority – appears to be promising; recommended for comprehensive Technology Assessment to confirm potential*

(Cumulative Score Maximums: Low 12; Medium 24; High 36. Insert final Triage Rating as "Low", "Medium", or "High" in box to the right)

Triage Rating

	FACTORS	TECHNOLOGY/COMMERCIAL ASSESSMENT RATINGS (Provide Factor Rating & Comments)				
	Technology	**Rating (L, M, H)**	**Low (1 point)**	**Medium (2 points)**	**High (3 points)**	**Comments**
1	Technology Description		Description is complex or unclear. Technical benefits and applications are poorly defined. With available information, limited description or knowledge of benefits/application, difficult to assess	Description conveys the core elements and functionality of the technology in a manner understandable to technology generalists. Some technical benefits and applications are defined.	Description comprehensively defines and thoroughly conveys core elements, functionality of the technology in a manner understandable to technology generalists, technical benefits and applications.	
2	Development Maturity		Technology is in the idea or concept stage of development (TML 1-2)	Technology is in the proof of concept/prototype development and testing stage (TML-3-5).	Technology is in the advance research and development stage or field trials (TML6-7).	
3	Transitioning Timeline		Most likely will not be ready to transition within the next 3 years (>3 years).	Most likely will not be ready to transition for 1 to 3 years.	Ready to transition now or within the next 12 months.	
4	Technology innovation		Technology is not novel. Competing technologies exist that do the same thing.	Technology is an incremental improvement over existing technology.	Technology is a significant improvement and will complement/enhance/improve current technology; part of existing portfolio interests, or could significantly improve forensic analysis, processes, process management or laboratory operations.	
5	Development and Transition Hurdles		There are difficult technical, developments, and economic challenges to be solved before the technology can be successfully transitioned/ commercialized.	There are a moderate number of technical, economical and development challenges to be solved before the technology can be successfully transitioned/ commercialized.	There are only a few easy solvable technical and development modifications that must be made to transition/commercialize the technology.	
6	Backlog Impact		Technology will not reduce backlog issues.	Technology will reduce backlog for a small number of labs or cases.	Technology will have significant backlog impact.	
7	Ease of Manufacture		Technology not producible, affordable, or reliable.	Technology is somewhat limited re: reducibility, affordability, or reliability.	Technology is producible, affordable, and reliable.	
8	Ease of Transition		Requires revolutionary changes in protocol or laboratory practice.	Requires significant change in protocol or laboratory practice.	Likely to be easily incorporated within current protocols and laboratory practice.	
9	User Community Interest		No interest from user community documented.	Limited interest from user community documented.	User interest is strong and documented.	
10	PI as Champion		PI(s) has little interest in providing longer-term assistance to facilitate adoption and/or a business seeking to commercialize his/her technology.	PI(s) has some interest in providing longer-term assistance to facilitate adoption and/or a business seeking to transition technology.	PI(s) has a strong interest in providing longer-term assistance to facilitate adoption and/or a business seeking to commercialize his/her technology.	
11	Community Dissemination		no publications or no record of contact with forensic community to minimal project awareness (presentation at conferences or online- no publications beyond final report)	PI has created awareness and documented findings— presentations and publications (forensic journals, newsletters, online media)	PI has promoted awareness, documentation and further technology transition efforts- actively pursued knowledge transfer activities (demonstrations, workshops, Beta testing)	
12	Forensic partner/collaborator input		Forensic partner/collaborator (FP/C) is identified and plays a "passive" role in the technology development process. FP/C typically functions as a reviewer of plans and documents or as a provider of samples and project requirements	FP/C plays an active role in development process—Assists technology development team, contributes to performance or programmatic metrics, helps with experimental design and project deliverables (sample analysis, dissemination and outreach)	PF/C serves on the technology development team. He/she performs or conducts one or more of the project's tasks, identifies opportunities for technology transition, works with potential customers to demonstrate, test and/or evaluate the technology, write reports, publish papers, etc.	
	Total:	Complete Total and Cumulative	#L	#M	#H	∑ Provide Sum Total Below
	Cumulative	Scores to right	#L x 1	#M x 2	#H x 3	

Preliminary Transition Planning Template

Preliminary Transition Planning Template

PI:

Organization:

Technology:

Technology Description

Non-Disclosing Description

Transition Status, Recommendations and Basis

☐ Knowledge Transfer (via roundtable, training event, publications)
☐ Commercialization (via licensing, j-v, of other supply chain or IP-based need)
☐ Strategic Alliance (e.g. appropriate for efforts with development requirements where finding a partner will move it forward)
☐ Already Transitioned (PI reports it is in use and no support is needed, be sure to capture details for success tracking)
☐ No Further Action (e.g., PI is not interested, or some other insurmountable barrier)
☐ Other (e.g., inadequate information, other recommendations)

PI Discussion

Summarize interview that considers questions such as:

- Can you describe the novel aspects of the research that enable greatest impact to the forensic community?
- Has there been any enabling public disclosure related to the research?
- Has there been additional research since the NIJ funded effort?
- What is the development stage? Concept- experimental- prototype?
  - ☐ TML 1: Basic (scientific) principles have been observed and reported
  - ☐ TML 2: Technology concept and application have been formulated
  - ☐ TML 3: Critical experimental function or proof-of-concept has been demonstrated
  - ☐ TML 4: Experimental technology or system has been tested and validated in the lab
  - ☐ TML 5: Actual technology has been demonstrated in a relevant environment
  - ☐ TML 6: Actual technology has been tested and validated in an operational environment (crime lab or field)
  - ☐ TML 7: Actual system has been proven through successful mission operations (crime lab or field)
- Have you done anything to transition the research to application?
- Have you done anything to protect any intellectual property?
- How does technology in the current development state compare with state-of-the-art?
- What else must be done before it is ready for application in forensic settings?
- Can you think of any barriers to adoption?

- Are there partners needed to work toward application and adoption?
- Who in the forensic community would benefit and how?
- How well does it fit with existing practices? Or, in other words, how easy will adoption/implementation be within forensic settings?
- Are there non-forensic applications that could help with transition (e.g., existing vendors, proof of concept)?
- Can you think of other potential applications that might enable this "dual-use" benefit for transition?
- Have you published or d you plan to publish this research?
- Have you spoken with any companies? Contacts? Can you suggest other contacts that might provide perspective and understanding o the issue/need and value of this technology or potential alternative solutions?]

Transition Status and Lessons Learned

Expert Input

Application Insight

Intellectual Property Issues

Plan Development By

Transition Plan Template

Grant number

Technology Transition Plan

Name of Grant	
Principle Investigator	
Grant Number	
Technology Overview	
Transition Readiness Level (TRL)	
Transition Approach	
Estimated Timing	
Current Partners	
Potential Partners	
Target User Communities	
IP Management	
Manuf./Scalability/Knowledge Transfer	
Other Issue Related to Standing Up Technology	

Technology Overview

Technology Benefits	Technology Challenges

Transition Status

Transition Plan

The goal of this effort is to (*pick enable use, transfer knowledge, or communicate successes*). The preliminary thinking is to (*what mechanism*) to *what outcome goal*. The proposed effort is as follows:

1. *High level action*
   a. *Details*