

# A Database of Criminal Justice Needs for Innovation: Requirements for Developers and Funders

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User Guide

JOHN S. HOLLYWOOD, BRIAN A. JACKSON, ANNIE BROTHERS,  
MARK BARRETT, DULANI WOODS, MICHAEL J. D. VERMEER



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## Preface

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On behalf of the National Institute of Justice (NIJ), the RAND Corporation, in partnership with the Police Executive Research Forum (PERF), RTI International, and the University of Denver, is carrying out a research effort, the Priority Criminal Justice Needs Initiative (PCJNI), to assess and prioritize technology needs across the criminal justice community. This effort is a component of NIJ's National Law Enforcement and Corrections Technology Center (NLECTC) System, which is an integral part of NIJ's science and technology program, and is intended to support innovation within the criminal justice enterprise. Mentions of products do not represent approval or endorsement by NIJ or the RAND Corporation.

Since 2015, the PCJNI has published more than 20 reports identifying and prioritizing criminal justice needs for innovation, including both sector-wide advisory panels and workshops on special topics. This product provides a database of all of the needs generated during the first five years of the PCJNI, along with this brief technical report describing the database. It will be of high interest to criminal justice developers, innovators, and funders who are seeking validated needs from the field's leading experts.

RAND Social and Economic Well-Being is a division of the RAND Corporation that seeks to actively improve the health and social and economic well-being of populations and communities throughout the world. This research was conducted in the Justice Policy Program within RAND Social and Economic Well-Being. The program focuses on such topics as access to justice, policing, corrections, drug policy, and court system reform, as well as other policy concerns pertaining to public safety and criminal and civil justice. For more information, email [justicepolicy@rand.org](mailto:justicepolicy@rand.org).

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## Summary

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This report provides documentation and user instructions for the database of the Priority Criminal Justice Needs Initiative's (PCJNI's) needs for innovation. Since 2015, the PCJNI has published more than 20 studies identifying and prioritizing criminal justice needs for innovation, including both sector-wide advisory panels and workshops on special topics, for the National Institute of Justice. The database contains summaries of the PCJNI's studies and captures all of the needs for criminal justice innovation resulting from these studies. The database further provides three different tools for selecting and reviewing needs, including a navigable, collapsible outline, a visualization tool for selecting needs through push-button menu options, and a standard Microsoft Excel table with filters. The database also includes Excel PivotTables and PivotCharts for users to create their own displays of needs by study, applicable technology, and priority. The database and this report assume that users have a basic familiarity with Excel and are able to use the tables, filters, and PivotTable interfaces.

## Acknowledgments

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We would like to thank the National Institute of Justice for all of their support for our studies over the past five years. We would especially like to thank all of the panelists in our advisory panels and workshops for their dedicated efforts. Without them, our identification of criminal justice needs for innovation would not have been possible.



# 1. Introduction

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On behalf of the National Institute of Justice (NIJ), the RAND Corporation, in partnership with the Police Executive Research Forum (PERF), RTI International, and the University of Denver, is carrying out a research effort to assess and prioritize technology needs across the criminal justice community. Since 2015, the Priority Criminal Justice Needs Initiative (PCJNI) has published more than 20 reports identifying and prioritizing criminal justice needs for innovation, including both sector-wide advisory panels and workshops on special topics. Participants in all PCJNI efforts were selected based on their professional experience and expertise in an effort to assemble a distinguished group of experts reflecting different types of criminal justice agencies and civil society and technical organizations for the topics being considered. All reports are available on the PCJNI's webpage, <https://www.rand.org/well-being/justice-policy/projects/priority-criminal-justice-needs.html>.

This product provides a navigable and searchable database (in the form of an Excel workbook) of the needs generated during the first five-year phase of the PCJNI, along with this brief technical report describing the database and providing summaries of the needs within it. This product will be of interest to criminal justice developers, innovators, and funders who are seeking validated needs from the field's leading experts within specific areas of interest. We plan on updating the database as new studies are published.

## 2. Summaries of Study Results to Date

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Table 2.1 summarizes the PCJNI studies to date and their top results.<sup>1</sup> The list is presented in reverse order, with the most-recent studies first.

**Table 2.1. Summary of PCJNI Studies**

Study	Author and Year of Publication	Top Needs and Findings at a Glance
Court Appearances Through Telepresence Advisory Workshop	Gourdet et al., 2020	(1) Research should be conducted on options for improving network connectivity and on best practices and minimum standards for audio setup. (2) Research should be conducted to assess the impact of telepresence technology on the experiences of witnesses and victims. (3) Technical issues that influence the effectiveness of telepresence technology should be identified, and national standards for the setup of telepresence systems should be developed. (4) A training curriculum for each of the different court actors who interact with telepresence technology in some capacity should be developed. (5) Model configurations that can be used to help purchasers make intelligent buying decisions should be developed. (6) Research is needed to better understand the effect of telepresence technology on defendants' experiences with the court process and perceptions of procedural justice. (7) Research should be conducted into the appropriate levels of video quality and image size, and implementation standards for courts should be developed. (8) Research is needed to determine whether there is a difference in cross-examinations that occur in person versus via telepresence technology. (9) Pilot courtrooms (e.g., laboratories) should be created where court staff can try new technologies and get more comfortable with them.
Leveraging Technology to Enhance Community Supervision: Identifying Needs to Address Current and Emerging Concerns	Russo, Woods, Drake, et al., 2019	(1) Automated tools are needed to quickly identify the most-important criminogenic risks and needs to target for each case. (2) Technology should be leveraged to identify prosocial behaviors, deliver positive reinforcement, and support incentive programs for offenders. (3) Technology is needed to support more-effective officer training; to assess whether training is implemented with fidelity; and to facilitate timely feedback to the officer. (4) Research is needed to evaluate the impact of a more mobile workforce on outcomes; best practices are needed to guide agencies as they implement mobility strategies. (5) Evaluations of technology-based approaches to supervising lower-risk offenders are needed. (6) Modern methods of communicating with offenders (e.g., text, chat, and social media) should be evaluated for effectiveness. (7) Research is needed to guide more-effective implementation of location monitoring technologies. (8) Research is needed to determine the predictive value of offender data (e.g., movement patterns) on recidivism. (9) Analytic and visualization tools should be leveraged to convert voluminous data sets into actionable intelligence. (10) Research is needed on the effectiveness of automated reminder strategies to reduce "failure to appear" violations. (11) Best practices are needed to guide the procurement and implementation of information technology solutions. (12) Advanced emergency duress systems should be evaluated for

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<sup>1</sup> The "Top Needs and Findings at a Glance" column reproduces material summarizing the findings and recommendations on the RAND webpages associated with each of these studies.

Study	Author and Year of Publication	Top Needs and Findings at a Glance
Identifying Law Enforcement Needs for Conducting Criminal Investigations Involving Evidence on the Dark Web	Goodison, Woods, et al., 2019	<p>potential to improve officer safety in the field. (13) Agencies need cost-effective approaches to meet their victim notification responsibilities.</p> <p>(1) Invest in training at all levels, from the most junior officer to the most senior. The junior levels need to know what to look for, and the senior levels need to ensure that appropriate levels of training are included in the training curriculum. (2) Invest in efforts aimed at improving information sharing across agencies both within the United States and across international borders. (3) Examine the benefits of further investing in established cross-organization structures that are designed to facilitate cooperation and information sharing. (4) Encourage organizations to develop new testing standards for forensic tools that are employed to collect evidence on computers that have been running dark web software. (5) Conduct research into modernizing laws associated with inspecting packages transmitted via the U.S. mail and similar services. (6) Conduct research into the increasingly interconnected nature of crime and criminals with an eye toward ensuring that law enforcement is able to focus on the highly visible tip of the iceberg that is represented by traditional crime, as well as the less visible, but extremely important, portion of that iceberg that is lurking beneath the surface and that has the potential to affect the health and welfare of populations both near and far.</p>
Law Enforcement Efforts to Fight the Opioid Crisis	Goodison, Vermeer, et al., 2019	<p>(1) Broaden the use of medication-assisted treatment (MAT) in the general population and increase accessibility. (2) Promote nonenforcement police outreach to connect individuals to treatment. (3) Explore alternative treatment models to better serve individuals with opioid use disorder (e.g., mobile MAT, tribal nation innovations). (4) Use medication-assisted and other treatment models in institutional and community corrections. (5) Explore the use of safe injection locations to facilitate incident response and provide treatment promotion opportunities. (6) Provide same-day, low-barrier access to treatment with a medication-first model of care. (7) Provide syringe services to reduce associated harms and create treatment intervention opportunities. (8) Use syndromic surveillance or sentinel indicators to recognize spikes in overdoses, new opioids, or emerging drug crises. (9) Create a trauma awareness early warning system for law enforcement stress exposure. (10) Provide mental health interventions for officers affected by the stresses of policing during the opioid crisis. (11) Develop funding models to allow labs to be agile in responding to needs for new equipment, methods, safety issues, etc. (12) Increase the frequency and scope of drug screens in death investigations to identify novel opioids and effects. (13) Use data from rapid analysis of seized materials to inform public health and law enforcement interventions.</p>
Countering Threats to Correctional Institution Security	Russo, Woods, Shaffer, et al., 2019	<p>(1) Understaffing is a major threat; staffing ratio standards are needed, as are recruitment and retention strategies to meet these standards. (2) Supervisors need better training and a manageable span of control in order to properly develop staff. (3) Tools are needed to identify staff prone to compromise. (4) Better technology and best practices are needed to detect drugs, cell phones, and weapons. (5) Fully electronic mail systems should be explored to reduce the influx of drugs and protect staff and inmates from harm. (6) Research and testing centers are needed to evaluate emerging technology solutions to threats (e.g., cell phones, drones). (7) Administrators need greater awareness of cyber threats and information technology-related risks and need increased capacity to address these risks. (8) Best practices are needed to balance inmate access to technology for reentry purposes with security concerns. (9) Best practices are needed for security threat group management. (10) Technology is needed to automate analysis of inmate communications. (11) Best practices are needed for the development of continuity of operations plans.</p>

Study	Author and Year of Publication	Top Needs and Findings at a Glance
<p>Fostering Innovation to Respond to Top Challenges in Law Enforcement:            Proceedings of the National Institute of Justice's 2018 Chiefs' Panel on Priority Law Enforcement Issues and Needs</p>	<p>Hollywood, Goodison, et al., 2019</p>	<p>(1) Today's policing environment is endangering officers' health, wellness, and performance; research on sources of stress, early warning systems for officers, and best practices for support to officers and families should be developed. (2) The proliferation of video evidence is causing major policy and resource challenges; systems to accelerate the review of video are needed. (3) Better approaches and tools are needed to improve community relations and trust; these include research on public-sentiment monitoring tools, interventions to improve police-community relations, and realistic interaction skills for the field. (3) Research is needed to identify the skills, abilities, and experiences that officers today and in the future will need. (4) Officers need help to address the flood of information, starting with taking inventory of the information analysis tools that are available. (5) In general, solutions need to be flexible and agile, able to be tailored to the size and nature of the agencies, and accepted by both officers in the field and communities. (6) There are several overarching challenges, including staffing and development shortfalls, public-private relationship issues, and vendors having too much control over technology directions, that do not have ready short-term solutions. These will require a longer-term collective effort, possibly including a National Commission on Criminal Justice that can consider systemic improvements to policing.</p>
<p>Prosecutor Priorities, Challenges, and Solutions</p>	<p>Lawrence et al., 2019</p>	<p>(1) Research is needed to improve staff recruitment, training, and retention. (2) Prosecutors need guidance on maximizing case investigation and trial resources. (3) Research is needed on promising practices for preventing and responding to witness intimidation and tampering, determining the most effective ratio of prosecutorial staff and support staff, determining whether different combinations of problem-solving and litigation strategies can reduce crime, and storing and retrieving digital evidence in the long term.</p>
<p>Managing the Seriously Mentally Ill in Corrections</p>	<p>Shaffer et al., 2019</p>	<p>(1) The criminal justice system should advocate for better access to treatment in the community. (2) Comprehensive, coordinated supportive services (e.g., housing, employment) and interventions targeting criminogenic needs (e.g., substance use disorders, antisocial thinking) pre- and post-justice involvement are needed. (2) A focus on prevention, early detection, and intervention is needed, particularly for children. (3) Law enforcement agencies need training to better respond to incidents involving individuals with serious mental illness and for alternatives to jail. (4) Courts need guidance on effective diversion strategies. (5) Institutions need more resources so that they can effectively treat and manage the population (e.g., meet both mental health and criminogenic needs); effective alternatives to administrative segregation are required. (6) Coordinated discharge planning is needed; inmates should leave with "warm hand-offs," referrals, an ample supply of medication, and uninterrupted benefits. (7) Barriers to collaboration and information-sharing among entities with a "need to know" must be removed. (8) The divide between the criminal justice system and the mental health system (e.g., treatment focus, approaches, duplication of efforts) needs to be bridged. (9) Cost-benefit analyses are required to support the redistribution of funding to the most-effective intervention points (e.g., pre-justice involvement, diversion, and reentry).</p>
<p>Using Video Analytics and Sensor Fusion in Law Enforcement: Building a Research Agenda That Includes Business Cases, Privacy and Civil Rights Protections, and Needs for Innovation</p>	<p>Hollywood, Vermeer, et al., 2018b</p>	<p>Status: Video analytics and sensor fusion (VA/SF) could be of great benefit in detecting crimes in progress, investigating crimes and incidents, monitoring performance, and protecting officers' health and safety. However, these technologies have a long way to go to reach their full potential. They also need substantial security, privacy, and civil rights protections to be used safely. Needs are as follows: (1) a development strategy, starting with improving capabilities to reliably detect baseline entities, activities, and events and then adopting more-sophisticated capabilities over time; (2) definitions by communities of the purposes for which these tools may be used locally, consistent with applicable law and</p>

Study	Author and Year of Publication	Top Needs and Findings at a Glance
		policy; and (3) an implementation strategy that starts with basic model policy development and education and then studies the use of technology to expedite policy and legal compliance.
Building a High-Quality Correctional Workforce: Identifying Challenges and Needs	Russo, Woods, Drake, et al., 2018	Needs are as follows: (1) a shift in orientation from punishment and surveillance to a human-services approach to enhance the corrections sector's ability to recruit new talent; (2) competency standards to improve the level of staff professionalism serve as the basis of performance evaluation; (3) assessment of the impact that inadequate funding for training can have on workforce issues and sector outcomes; (4) minimum standards to ensure that training curricula are adequate, consistent, relevant, realistic, and delivered in an effective manner; (5) standards to control excessive workloads, which can lead to both staff turnover and inadequate mission performance; (6) promotion of best practices proven to influence the factors related to turnover; (7) best practices for line staff to assume more decisionmaking authority and to participate more in policy discussions; (8) greater development of future leaders; and (9) better training for supervisors, which is key to line-staff development.
Using Social Media and Social Network Analysis in Law Enforcement: Creating a Research Agenda, Including Business Cases, Protections, and Technology Needs	Hollywood, Vermeer, et al., 2018a	Status: The panel discussed five core business cases: monitoring for activity indicating short-term safety threats in postings and communicating responses as needed, identifying those at high risk for involvement in violence, actively monitoring the high-risk individuals to see whether violence may be imminent, investigating organized crime networks, and investigating specific crimes. The panel also discussed one core case not to do: monitoring First Amendment–protected activity for vague or unspecified purposes. The panel also discussed core security, privacy, and civil rights protections for data, analysis, and actions using the results from the analyses. Needs are as follows: (1) support for working with communities to develop policies and strategies for using social media and social network analysis, (2) research on new and improved, law enforcement–specific, social media and social network analytic techniques, (3) support for law enforcement–specific training on social media and social network analysis, and (4) a help desk to help law enforcement agencies navigate requests to social media companies.
Identifying Law Enforcement Needs for Access to Digital Evidence in Remote Data Centers	Vermeer, Woods, and Jackson, 2018	Needs are as follows: (1) exchanges for points of contact and on the types of data held by service providers, devices, and apps; (2) means of developing a shared perspective and improving cooperation between law enforcement and providers; (3) better investigator access to information and training on requesting remote digital evidence, including creating databases and portals from which practitioners could exchange documentation and access standardized online training and best practices; (4) better standards for serving legal process and incentivizing research communities to keep methodologies for digital evidence acquisition current; and (5) improvements to the Mutual Legal Assistance Treaty (MLAT) process, to include an online docketing system, research and analysis on MLAT data to identify bottlenecks, development of a uniform system of jurisdiction, better training and information on U.S. law for U.S. trainers of foreign nationals, and research on expanding the MLAT regime to cover current gaps.
Strategies to Mitigate the Impact of Electronic Communication and Electronic Devices on the Right to a Fair Trial	Dawson et al., 2018	Status: Panelists noted that legislation may help mitigate some of the problems introduced by electronic communication, but judges need discretion in their own courtrooms. Judges and attorneys need flexibility in engaging with jurors, who are used to communicating electronically throughout the day but must be limited during trial proceedings. Electronic device bans in the courtroom were viewed as effective in mitigating witness intimidation, but jury sequestration to minimize or eliminate misconduct with electronic communication was considered to be generally impractical and counterproductive. More public education would clarify the importance of due process and how electronic and social media communication may violate the constitutional rights of defendants and

Study	Author and Year of Publication	Top Needs and Findings at a Glance
		<p>other parties to a case. Continuing education is needed for the judiciary and court practitioners on evolving modes of electronic communication. Needs are as follows: (1) fundamental research on how the exploding volume of electronic data could affect the protection of rights, (2) methods to better assess the effect on the judicial process of jurors' "outside research" during trials, (3) approaches both to limit juror use of mobile devices to do outside research during trials and to educate jurors on this issue, and (4) methods to monitor juror and defendant social media activity, given concerns about the use of social media to influence judicial processes.</p>
<p>Wearable Technologies for Law Enforcement: Multifunctional Vest System Options</p>	<p>Silberglitt, Lauland, et al., 2017</p>	<p>Note: Rather than a panel or workshop to generate needs, this study provides three technical concepts for integrating technologies into wearable vests. This study is intended to show how to help meet needs from other studies by leveraging technology opportunities for making wearable vests feasible.</p>
<p>Caring for Those in Custody: Identifying High-Priority Needs to Reduce Mortality in Correctional Facilities</p>	<p>Russo, Woods, Shaffer, et al., 2017</p>	<p>(1) Facilities should provide medical and mental health services at a community-level standard of care. (2) Correctional facilities need to better manage organizational and cultural conflicts between security and care objectives. (3) Capacity for medical, mental health, and substance abuse care should be increased, both within facilities during incarceration and in the community after release. (4) Availability of medication-assisted therapies and drug overdose countermeasures should be expanded. (5) Adoption of best practices in suicide risk assessment and prevention should be more uniform. (6) More and better data are required in order to develop targeted interventions to reduce mortality. (7) Incentives and support should be provided to improve compliance with national standards for medical screening and care provision. (8) Uniformity in how internal death reviews are conducted, including multidisciplinary participation, should be established. (9) There should be more-effective discharge planning and "warm hand-offs" to community-based health providers. (10) There should be greater electronic information sharing between and among correctional institutions and community-based health providers to improve care and reduce inmate mortality.</p>
<p>Envisioning an Alternative Future for the Corrections Sector Within the U.S. Criminal Justice System</p>	<p>Russo, Drake, et al., 2017</p>	<p>Status: (1) The judicial and policy decisions and public attitudes toward crime and sentencing determine the corrections population and the resources available for staffing and reform. The sector has control over how offenders are treated once they enter the system. (2) The sector's primary role should be to facilitate positive offender behavioral change, but three broad types of changes would be necessary for the sector to support this mission successfully: new programs and improved education and training for corrections staff, the elimination of revenue-generating correctional operations, and cultural change to prioritize rehabilitation over punishment. (3) The sector can use the latest developments in science, technology, and evidence-based practices to create alternatives to incarceration, guide the investment of scarce resources, and engage communities in initiatives to reduce recidivism and support offender reentry. Needs are as follows: (1) To support facilitating positive behavior change, examine diverting low-risk offenders and those with mental health or substance use problems to specialty facilities while reserving prisons for violent and dangerous offenders, shortening sentences and ensuring that offenders have a clear, attainable path to release, and creating smaller and safer facilities that are closer to cities with programs to support reentry. (2) Expand and adequately fund probation, parole, and community-based resources to support offenders' reentry into their communities. (Note: This study did not generate and prioritize specific needs.)</p>
<p>Fostering Innovation in U.S. Law Enforcement:</p>	<p>Hollywood, Woods, Goodison,</p>	<p>Needs are as follows: (1) practices and technologies to improve practitioners' knowledge of technologies and how to use them, including creating a <i>virtual information repository</i>: a single source for capturing and</p>

Study	Author and Year of Publication	Top Needs and Findings at a Glance
Identifying High-Priority Technology and Other Needs for Improving Law Enforcement Operations and Outcomes	et al., 2017	sharing law enforcement information; (2) practices and technologies to improve police-community relations; (3) improvements to the sharing and use of information, to include identifying what information is most useful to address officers' information overload; (4) improved forensic capabilities, starting with remediating forensic backlogs and the lack of resources driving them; (5) improvements to a variety of personal equipment and practices for using them; (6) policies and core use cases for unmanned aerial systems; (6) improvements to dispatch center operations; (7) improved defenses against active shooters, to include measures to better detect and report would-be shooters and better training for how the public should respond; and (8) specific requirements for technologies to improve officers' physical and mental health.
Future-Proofing Justice: Building a Research Agenda to Address the Effects of Technological Change on the Protection of Constitutional Rights	Jackson, Banks, Woods, et al., 2017	Status: The emerging technologies considered by the panel included courtroom technologies, body-integrated technologies, carried devices, personal computing devices, home-integrated and household technologies, vehicle-integrated technologies, and the societal technology ecosystem. Needs are as follows: (1) best-practice and training development to address such issues as criminal justice data quality and its implications for individuals' rights, data retention, disclosure of collected data, public examination and correction of criminal justice data, telepresence, and social media use by criminal justice participants; (2) evaluations work to better understand how analytic tools (such as risk assessment instruments) perform; and (3) fundamental research on such topics as how the exploding volume of electronic data could affect the protection of rights.
Using Future Broadband Communications Technologies to Strengthen Law Enforcement	Hollywood, Woods, Lauland, et al., 2016	(1) Support is needed for the emergence of a future broadband network in which law enforcement users will be able to communicate seamlessly and securely over whatever Internet point of access is the best fit at any specific location, time, and situation. This includes guidance for agencies on how to acquire, manage, and use the forthcoming technologies. It also includes providing high-quality service in rural and sparsely populated areas. (2) Capabilities are needed to filter, prioritize, and make sense out of all of the new data that the future broadband networks will transmit. This includes developing smart software agents that can prioritize what officers in the field need to see in different operational contexts.
Fostering Innovation in the U.S. Court System: Identifying High-Priority Technology and Other Needs for Improving Court Operations and Outcomes	Jackson, Banks, Hollywood, et al., 2016	(1) Leverage opportunities for greater court efficiency while ensuring that technology serves justice goals. (2) Improve security and emergency preparedness. (3) Improve quality and utilization of shared data in the justice system. (4) Strengthen analysis and use of data. (4) Address concerns in maintaining and protecting the court record. (5) Address basic technology shortfalls in today's courts. (6) Improve court technology acquisition processes. (7) Use technology for notification and public communication.
Using Future Internet Technologies to Strengthen Criminal Justice	Hollywood, Woods, Silbergliitt, et al., 2015	(1) Partner with the Standards Coordinating Council and constituent information-sharing development efforts to explore how semantic tagging and intelligent agents might be leveraged to expedite information-sharing, with criminal history data as a starting point. (2) Experiments with real-time language technologies are needed. (3) Education efforts are needed on semantic technologies that support finding, accessing, and translating key information; sensor systems for monitoring officer health, officer safety, and maintaining community supervision; video conferencing; and civil rights, privacy rights, and cybersecurity protections. (4) Designate a group to develop law enforcement requirements, policies, and procedures for interfacing with self-driving cars. (5) Develop field experiments with video teleconferencing links for inmate communications and remote education. (6) Novel business models and support should be used to make Internet links more affordable in rural areas. (7) Experiment with health and safety sensor feeds, both wearable and embedded, and with

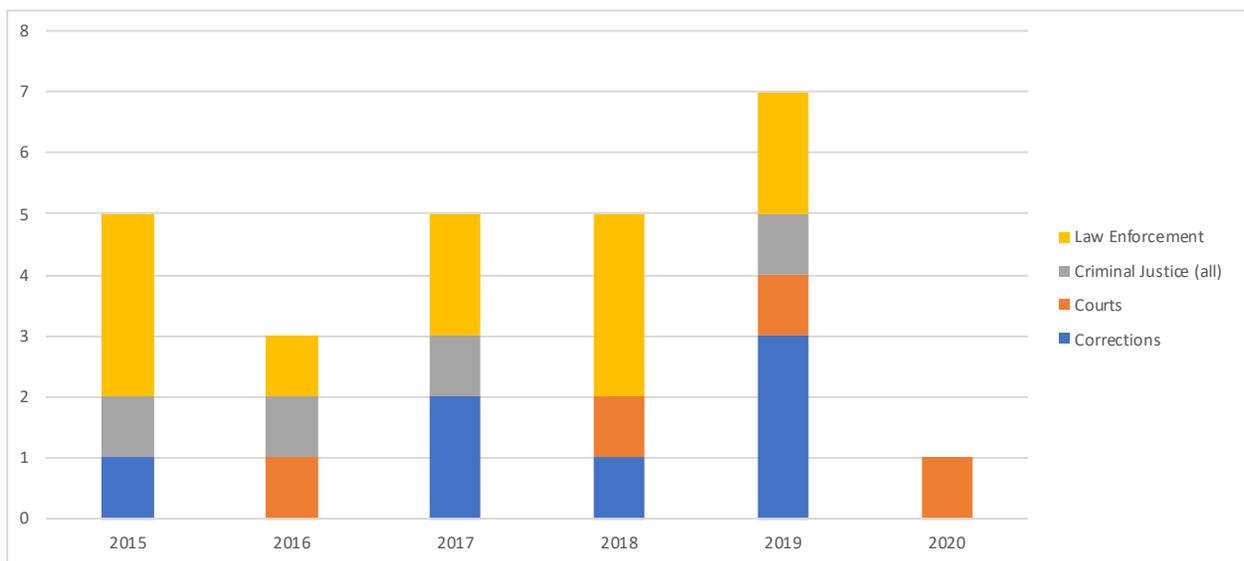
Study	Author and Year of Publication	Top Needs and Findings at a Glance
		<p>Internet-connected sensor systems to support maintaining the location and tracking of offenders under community corrections supervision. (8) Development processes should be implemented so that civil rights, privacy rights, and cybersecurity protections are built into technology developments, standards, policies, and procedures from the beginning. (9) For intelligent agents that support decisionmaking, research how to ensure the quality of data used to make the decision, and how decisionmakers should use the agents' recommendations. (10) Conduct research to identify common attributes for policies, procedures, and required protective technologies for sensors related to the Internet of Things.</p>
<p>Improving Information-Sharing Across Law Enforcement: Why Can't We Know?</p>	<p>Hollywood and Winkelman, 2015</p>	<p>Note: This study was a technical assessment of barriers to information sharing in law enforcement; it did not generate specific needs. Needs are as follows: (1) language for requests for proposals that stipulates compliance with existing standards, connectivity with specific federal, state, and regional systems, ease of exporting data, and a chance to test information-sharing capabilities during the acquisition process; (2) a common business process that brings together practitioners and developers in identifying requirements for law enforcement IT systems; and (3) a multilayer framework for sharing law enforcement information, building on earlier efforts. This should include a master data model describing how to share data elements used across multiple standards, software development kits for building and implementing standards, and expanded testing and certification. It should also include critical interfaces that have not yet been captured in existing or planned standards.</p>
<p>Digital Evidence and the U.S. Criminal Justice System: Identifying Technology and Other Needs to More Effectively Acquire and Utilize Digital Evidence</p>	<p>Goodison, Davis, and Jackson, 2015</p>	<p>(1) Education of prosecutors and judges is needed in federal digital evidence training programs. (2) Training is needed on digital evidence handling and preservation on scene, at the academy level and as a part of investigator training. (3) Methods and tools are needed to better prioritize and triage analysis of digital evidence given scarce resources. These include tools for detectives in the field to triage evidence and development of guidelines for digital evidence examiners to better prioritize their workload. (4) Regional models are needed to make digital evidence analysis capability available to small departments. (5) Resources are needed to maintain the currency of training and technology available to digital forensic examiners.</p>
<p>Visions of Law Enforcement Technology in the Period 2024-2034: Report of the Law Enforcement Futuring Workshop</p>	<p>Silberglitt, Chow, et al., 2015</p>	<p>Needs are as follows: (1) educational material on social media to better engage the public; (2) research on technologies, processes, and policies to share and use information more effectively; (3) research on using tagging and tracking tools; (4) research on innovative policing practices and change management techniques to implement them successfully; (5) improved approaches to train on new technologies; (6) improved translation technologies, including dialect, indigenous language, and cultural factors translations; (7) research on ethics development; (8) updated law enforcement recruiting and training academy practices; (9) methods for personnel to create and use artificial online identities; and (10) technology to measure impairment from custom-made drugs and biological agents.</p>
<p>High-Priority Information Technology Needs for Law Enforcement</p>	<p>Hollywood, Boon, et al., 2015</p>	<p>Needs are as follows: (1) improved systems for monitoring and protecting the health of officers, including both physical and mental health; (2) improved security, privacy, and civil rights policies for using information technology (IT); (3) improved affordability of law enforcement IT systems across their entire life cycles; (4) practices that can leverage IT effectively to reduce crime; (5) improved IT, along with supporting training and policies, to help law enforcement respond to major incidents, including systems for tracking personnel during responses; (6) improved deployable sensors, including body-worn cameras, field biometrics, electronic evidence collection systems, and video surveillance systems; (7) designation of a federal coordinator for technology-related outreach</p>

Study	Author and Year of Publication	Top Needs and Findings at a Glance
		who will maintain and monitor a master list of outstanding technology needs, ongoing development and deployment tasks to address them, and dissemination of results to date out to the field; and (8) development of common operational picture/dashboard displays to law enforcement officers.
Fostering Innovation in Community and Institutional Corrections: Identifying High-Priority Technology and Other Needs for the U.S. Corrections Sector	Jackson, Russo, et al., 2015	Needs are as follows: (1) information sharing tools; (2) deception detection tools; (3) novel illegal drug detection tools; (4) automated translation tools; (5) novel and improved scanners and detectors for detecting weapons and other contraband materials; (6) tools for social media monitoring; (7) a study on how requirements for restitution affect the ability of offenders to successfully reintegrate into society and not return to prison; and (8) development of much broader alternatives to incarceration for categories of offenses or offenders.

NOTE: Some study names are shortened in this table. These shortened versions are used to reference the needs of the studies in the Needs Table of the database.

Figure 2.1 summarizes the number of studies by year and by the community of practice served (law enforcement, courts, corrections, schools, or criminal justice as a whole).

**Figure 2.1. PCJNI Studies by Publication Year and Community of Practice**



### 3. Summary of the Needs

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#### Needs by Study

Table 3.1 shows the needs by short study title and priority, with tier 1 needs being high priority, tier 2 needs being medium priority, and tier 3 needs being comparatively low priority. The PCJNI’s panelists assessed the priority of each need by rating both its importance to the field if a solution to the need was fielded and its feasibility, in terms of whether a solution could likely be created and fielded over the next few years.<sup>2</sup> As discussed in the introduction to this report, the panels were selected in an effort to assemble a group with both the necessary practitioner experience and technical expertise to be able to prioritize needs effectively. As shown, the studies collectively generated well over 1,000 needs, with close to 400 being high priority (tier 1).

**Table 3.1. Needs by Study and Priority Tier**

<b>Studies</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>Grand Total</b>
Adv. Panel: Community Corrections	19	32	38	89
Adv. Panel: Courts	28	75	28	131
Adv. Panel: Institutional Corrections	29	64	40	133
Adv. Panel: Law Enforcement	50	45	58	153
Adv. Panel: Law Enforcement Chiefs	7	15	11	33
Workshop: Community Supervision Technology	17	10	17	44
Workshop: Corrections Care for Mentally Ill	22	21	3	46
Workshop: Corrections Institutional Security Threats	18	8	13	39
Workshop: Corrections Mortality	16	50	17	83
Workshop: Corrections Workforce	13	23	28	64
Workshop: Court Appearances Through Telepresence Advisory	10	6	8	24
Workshop: Courts’ Responses to Electronics at Trials	0	7	0	7
Workshop: Courts’ Support to Prosecutors	8	13	7	28
Workshop: Dark Web	20	19	6	45
Workshop: Digital Evidence	9	23	0	32
Workshop: Future Internet Technologies	17	23	5	45
Workshop: Law Enf. Access to Remote Data Centers	7	18	13	38
Workshop: Law Enf. Use of Social Media & Social Network Analysis	18	10	8	36
Workshop: Law Enf. Use of Video Analytics & Sensor Fusion	18	4	0	22

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<sup>2</sup> For more information about the prioritization of needs during the PCJNI’s advisory panels and workshops, please refer to any of the PCJNI reports, available at <https://www.rand.org/well-being/justice-policy/projects/priority-criminal-justice-needs/publications.html>.

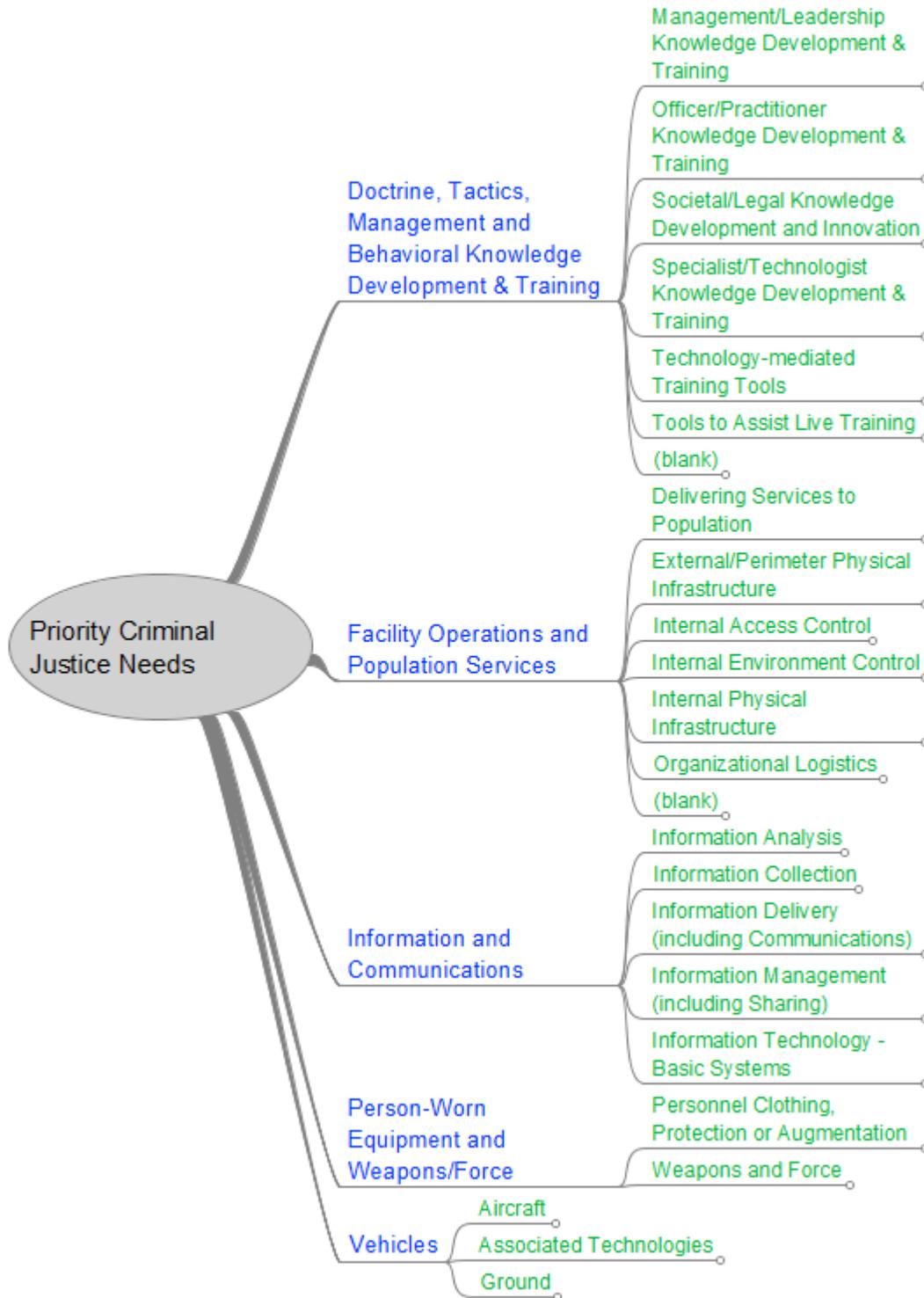
<b>Studies</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>Grand Total</b>
Workshop: Law Enforcement Broadband	19	0	0	19
Workshop: Law Enforcement Futures	14	10	8	32
Workshop: Opioids Crisis	13	0	0	13
Workshop: Technologies and Constitutional Rights	14	13	10	37
<b>Grand Total</b>	<b>386</b>	<b>489</b>	<b>318</b>	<b>1193</b>

NOTE: Adv. = Advisory. Enf. = Enforcement.

## Needs by Technology Taxonomy

We developed a taxonomy for categorizing the needs by the technologies they are concerned with. Here, *technologies* include nonmaterial development of management practices, policy, personnel, and training. Note that a need can be categorized as applying to more than one technology. Figure 3.1 provides a diagram of the first two levels of the taxonomy, captured in the mind-mapping tool FreeMind. The complete technology taxonomy is provided as a table in the needs database.

Figure 3.1. Technology Taxonomy for Categorizing Needs



NOTE: The order in which technology categories are shown here does not match the order in the database.

Figure 3.2 shows a heat map of the percentage of needs, across all studies, by technology category (using the first two levels of the taxonomy) and community of practice. Table cells with greater percentages are colored a deeper shade of green.

**Figure 3.2. Heat Map of Criminal Justice Needs**

Taxonomy Category 1	2	Corrections	Courts	Criminal Justice (all)	Law Enforcement	Grand Total
Doctrines, Tactics, Management and Behavioral Knowledge Development & Training	Management/Leadership Knowledge Development & Training	14.2%	5.9%	2.1%	8.4%	30.7%
	Officer/Practitioner Knowledge Development & Training	3.7%	0.6%	0.4%	2.7%	7.4%
	Societal/Legal Knowledge Development & Innovation	2.2%	1.1%	1.3%	1.2%	5.8%
	Specialist/Technologist Knowledge Development & Training	1.1%	0.5%	1.2%	2.4%	5.2%
	Technology-Mediated Training Tools	0.9%	0.2%	0.0%	0.2%	1.3%
	Tools to Assist Live Training	0.1%	0.0%	0.0%	0.1%	0.2%
Facility Operations and Population Services	Delivering Services to Population	2.3%	0.0%	0.1%	0.0%	2.4%
	External/Perimeter Physical Infrastructure	0.1%	0.1%	0.0%	0.0%	0.2%
	Internal Access Control	0.0%	0.0%	0.0%	0.0%	0.0%
	Internal Environment Control	0.8%	0.1%	0.0%	0.0%	1.0%
	Internal Physical Infrastructure	0.9%	0.3%	0.0%	0.5%	1.7%
	Organizational Logistics	0.1%	0.1%	0.0%	0.5%	0.7%
Information and Communications	External Communications	0.0%	0.2%	0.0%	0.0%	0.2%
	Information Analysis	3.7%	0.6%	2.1%	2.6%	9.0%
	Information Collection	5.7%	0.9%	1.6%	3.2%	11.5%
	Information Delivery (including Communications)	1.6%	1.9%	0.7%	2.5%	6.6%
	Information Management (including Sharing)	2.0%	2.5%	0.7%	3.4%	8.5%
	Information Technology—Basic Systems	0.6%	0.8%	0.3%	1.7%	3.4%
Person-Worn Equipment and Weapons/Force	Surveillance/Monitoring	0.0%	0.0%	0.1%	0.0%	0.1%
	Personnel Clothing, Protection or Augmentation	0.5%	0.0%	0.2%	0.8%	1.4%
Vehicles	Weapons and Force	0.5%	0.0%	0.0%	0.5%	1.0%
	Aircraft	0.3%	0.0%	0.0%	0.3%	0.6%
	Ground	0.3%	0.0%	0.0%	0.4%	0.8%
	Vehicle-Associated Technologies	0.2%	0.0%	0.0%	0.3%	0.4%
<b>Grand Total</b>		<b>41.9%</b>	<b>15.9%</b>	<b>10.6%</b>	<b>31.6%</b>	<b>100.0%</b>

As shown, the plurality of needs from the expert panels concerned management/leadership knowledge development and training, with more than one-quarter of total needs. Many other needs fell in the nonmaterial category—i.e., “Doctrines, Tactics, Management and Behavioral Knowledge Development & Training”—in general. There also was a considerable number of needs concerning information, ranging across information collection, analysis, delivery, and management. In contrast, there were comparatively few needs related to facilities, equipment and weapons, and vehicles. Looking at communities of practice, corrections had the greatest number of needs, followed by law enforcement, with courts in third. The combination of management/leadership and corrections was the most frequent, accounting for almost 13 percent of all needs alone.

## 4. The Needs Database

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The *Needs Database* is an Excel workbook that provides the following worksheets:

- **Studies:** This worksheet provides data on each study that has been part of the PCJNI.
- **Studies Charts:** This is a dynamic PivotChart that can generate graphs of studies by community of practice served, year published, and type of topic being addressed (i.e., the community of practice’s needs, taking advantage of an emerging technology, addressing a weakness in criminal justice operations, or addressing a technology-related threat to criminal justice).
- **Needs Explorer:** This is a dynamic, collapsible outline of all needs that allows users to explore the needs by technology (through the first three levels of the technology taxonomy), study, or needs priority tier.
- **Needs Selector:** This is a dynamic visualization that allows users to select a set of needs by study, technology (through the first three levels of the technology taxonomy), priority tier, and/or keyword or key phrase.
- **Needs Table:** This is the full table of needs from all studies, presented in a traditional Excel table format. The table’s filters also allow selection of needs by study, technology type (through the first four levels of the taxonomy), and priority. It also has a “quick-search” feature that allows for typing in a keyword and seeing the first 25 matching needs below it.
- **Needs Pivot:** This is a dynamic PivotTable that can generate summary statistics about the needs by study, technology taxonomy category (through the first four layers of the technology taxonomy), and priority.
- **Needs Charts:** This is a dynamic PivotChart that can generate graphs of needs by study, technology type (first four layers of the technology taxonomy), and priority.
- **Tech Taxonomy:** This is the complete technology taxonomy presented in outline form.

Documentation for each of these worksheets is provided below, and a column-by-column “dictionary” of each of the sheets is provided in the Appendix.

### Studies Table

Figure 4.1 shows the Studies table. It is an extended version of Table 2.1 that adds fields on the type of topic being addressed (i.e., the community of practice’s needs, taking advantage of an emerging technology, addressing a weakness in criminal justice operations, or addressing a technology-related threat to criminal justice). The “Study” field provides a shortened version of the study title that is used to reference the study’s needs in the Needs Table.

**Figure 4.1. The Studies Table**

Study	Year	Community of Practice	Addressing What	Top Needs and Findings at a Glance
Fostering Innovation to Respond to Top Challenges in Law Enforcement: Proceedings of the National Institute of Justice's 2018 Chiefs' Panel on Priority Law Enforcement Issues and Needs	2019	Law Enforcement	Community Needs	(1) Today's policing environment is en... research on sources of stress, early war... support to officers and families should a... evidence is causing major policy and reso... video are needed. (3) Better approaches ar... relations and trust; these include research o... interventions to improve police-commun... field. (3) Research is needed to identi... today and the future will need. (4) Offi... starating with inventorying the inform... solutions need to be flexible and agile, t... accepted by both officers in the field and l... challenges, including staffing and developn... and vendors having too much control over te... term solutions. These will require long... Commission on Criminal Justice that can
Prosecutor Priorities, Challenges, and	2019	Courts	Community Needs	(1) Research to improve staff recruitment, prosecutors on maximizing case investigati... practices for: preventing and responding to v... the most effective ratio of prosecutorial staff

NOTE: The figure is only intended to show a sample layout. For content, see the corresponding tab in the spreadsheet.

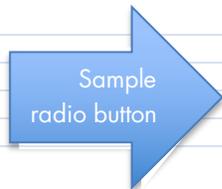
The subsequent Studies Charts worksheet is a dynamic Excel PivotChart that allows users to make graphs of the counts of studies over time, by community of practice, and by topic.

## Needs Explorer

Figure 4.2 shows part of the Needs Explorer worksheet. This uses Excel PivotTable features to create a collapsible outline of the needs, allowing users to navigate through the needs by the first three levels of the technology taxonomy (columns A through C), the study priority tier (column D) and the study (column E). Users can expand or collapse levels of the outline using the small radio buttons to the left of the outline headings.

**Figure 4.2. The Needs Explorer Worksheet**

Taxonomy Category 1	2	3	Tier	Study	Full Need
Doctrine, Tactics, Management and Behavioral Knowledge					
[-] Development & Training					
	Management/Leadership Knowledge				
	Development & Training				
		Acquisition and Technology			
		[-] Decisionmaking			
				1	
					[-] Adv. Panel: Institutional Corrections
					Issue: Contraband coming into facilities. Need: Prevention so that improvements in s
					[+] Adv. Panel: Courts
					[+] Adv. Panel: Law Enforcement
				2	
					[-] Adv. Panel: Institutional Corrections
					Issue: Apparent planned obsolescence (e.g., systems being phased out). Need: Maintenance and maintenance.
					Issue: New vendor-driven business models provide revenue to agencies. Need: Cost assessment of security and other impl
					Issue: New vendor-driven business models provide revenue to agencies. Need: Cost assessment of security and other impl
					Issue: Technology providers of management systems. Need: Maintenance and require (if needed) conversion to
					[-] Adv. Panel: Community Corrections
					Issue: Too few useful technologies for complicating procurement. Need: Development of key equipment at lower cost, and performance (e.g., radios, handcuffs, flashlights, communication systems).
					[+] Adv. Panel: Courts
					[+] Adv. Panel: Law Enforcement



The collapsible outline is instrumented as an Excel PivotTable, so users can change the hierarchy of the outline (to, say, navigate by study and then by technologies, or vice versa) by changing the order of items in the “Rows” box of the PivotTable Fields list. The data source for this outline is the Needs Table worksheet (see Figure 4.4).

## Needs Selector

The Needs Selector is a dynamic visualization of needs (also built on PivotTables, this time using Excel’s slicer feature) that allows users to press buttons on small menus (the slicers) to

select needs by study, first three levels of the technology taxonomy, and/or priority tier. To select multiple items at once on a slicer, click on the icon in the upper right with multiple checkmarks; to clear the items selection, click on the icon in the upper right with a red X.

This visualization adds a keyword/key phrase search box, accessible by clicking on the small button that appears next to “Click here to search needs.” The button labeled “Click here to clear search” does just that. Searches are not case sensitive.

Figure 4.3 shows the Needs Selector, here set up to select only Information and Communications and Information Collection technology–related needs of priority tier 1 (high) that include the keyword “Contraband.”

**Figure 4.3. The Needs Selector**

The screenshot shows the Needs Selector interface with the following filters and results:

- Study:** Institutional Corrections
- Taxonomy Category 2:** Information and Communications
- Taxonomy Category 3:** Information Collection
- Tier:** 1
- Search:** Full Need (Multiple Items)

Study	Issue	Need	Min of Tier
Adv. Panel: Institutional Corrections	Issue: Contraband coming into facilities at fence lines.	Need: Commercialize military-developed surveillance technologies for use in the corrections environment.	1
Adv. Panel: Institutional Corrections	Issue: Contraband coming into facilities at fence lines.	Need: Develop cost-effective UAV technology suitable for perimeter monitoring.	1
Adv. Panel: Institutional Corrections	Issue: Contraband coming into facilities at fence lines.	Need: Use available infrared sensor-based fencing (e.g., FLIR Thermal Fence™) for perimeter security	1
Adv. Panel: Institutional Corrections	Issue: Contraband coming into facilities through logistics systems.	Need: Develop higher throughput and cheaper scanning technologies to scan incoming logistical shipments to facilities	1
Adv. Panel: Institutional Corrections	Issue: Contraband coming into facilities transported by visitors, staff, or incoming inmates.	Need: Develop a single overall scanning portal suitable for detecting all types of contraband for individuals coming into the facility (e.g., millimeter wave, including explosive trace detection) at reasonable cost and a small enough footprint for use in existing facilities.	1
Adv. Panel: Institutional Corrections	Issue: Inmate use of social media inside facilities (e.g., via contraband cell phones) for communication.	Need: Adapt available automated tools for doing social media analysis of inmate activity to the needs of and constitutional concerns associated with use by corrections agencies (e.g., identifying links between inmates and corrections staff).	1

## Needs Table

The Needs Table is a conventional Excel table with filters added, covering all needs from the PCJNI’s studies. The text describing the need is in column E. The filters support selection of needs by study (column C), community of practice (column D), first four levels of the technology taxonomy (columns F through I), and priority tier (column J). All needs also have a unique identification number (column K) and a field for a *counter* (column L), which is 1 divided by the number of times the need text appears in the table. This is because the need appears in the table every time it was assigned a technology taxonomy categorization, so a need that has multiple categorizations appears on multiple rows in the table. Thus, a counter of 0.5 means the need appears twice in the table. This field is used to provide correct counts of the total number of needs per study; otherwise, many needs would be counted more than once.

We have added a quick-search box (cell N1) that allows for searching by keyword or key phrase, returning the first 25 needs matching the keyword.<sup>3</sup> The search is not case sensitive, but only supports a single keyword or exact key phrase. Also, unlike the Needs Selector, the quick search cannot be used in conjunction with the table filters for study, technology, and priority. To search needs text along with other table filters, click on the filter button for the “Full Need” column (column E) and type a keyword or key phrase in the search box that pops up.

Figure 4.4 shows the Needs Table. In this case, the quick-search box shows the first needs that include the word “Contraband.”

**Figure 4.4. The Needs Table**

Study	Full Need	Taxonomy Category 1	2	3	4	Tier	ID	Quick search for:
Adv. Panel: Institutional Corrections	Issue: New vendor-driven business models (e.g., video visitation, inmate email systems) conflicting with other system goals, even if they provide revenue to agencies. Need: Develop policies to require vendors to ensure access to services to individuals who cannot pay for new modes (e.g., low-income inmates families who may not be able to afford remote video visitation costs).	Doctrine, Tactics, Management and Behavioral Knowledge Development & Training	Management/Leadership Knowledge Development & Training	Acquisition and Technology Decisionmaking		2	1	Contraband
Adv. Panel: Institutional Corrections	Issue: New vendor-driven business models (e.g., video visitation, inmate email systems) conflicting with other system goals, even if they provide revenue to agencies. Need: Develop decision tools to structure the cost-benefit analyses of new service models that better weigh assessment of security and other implications against their potential revenue benefits	Doctrine, Tactics, Management and Behavioral Knowledge Development & Training	Management/Leadership Knowledge Development & Training	Acquisition and Technology Decisionmaking		2	2	Issue: Contraband coming into facilities by employees. Need: Develop 2 and implement policies and practices to systematically search all employees coming into facilities
Adv. Panel: Institutional Corrections	Issue: Apparent planned obsolescence of technology systems procured by agencies, forcing replacement (e.g., replacement parts for existing systems being phased out). Need: Make changes in procurement policy and practice to require sufficient contract terms that include service and maintenance.	Doctrine, Tactics, Management and Behavioral Knowledge Development & Training	Management/Leadership Knowledge Development & Training	Acquisition and Technology Decisionmaking		2	3	Issue: Contraband coming into facilities by employees. Need: Work 3 with staff and unions to address resistance to comprehensive monitoring and searching of employees
Adv. Panel: Institutional Corrections	Issue: Proprietary features and architectures built into technology systems that lock agencies into single suppliers. Need: Make changes in procurement policy and practice to structure contracts and require compliance with technology standards to prevent proprietary lock-in.	Doctrine, Tactics, Management and Behavioral Knowledge Development & Training	Management/Leadership Knowledge Development & Training	Acquisition and Technology Decisionmaking		3	4	Issue: Contraband coming into facilities from visitors. Need: Change 4 visitation practices (e.g., greater virtual visitation) to reduce opportunities for visitors to physically bring contraband into facilities.
Adv. Panel: Institutional Corrections	Issue: Educational and entertainment suppliers that link available content to proprietary hardware, locking facilities to that supplier. Need: Develop contracts and procurement practices that require the ability to use third-party material on systems designed to deliver educational and other content to inmates.	Doctrine, Tactics, Management and Behavioral Knowledge Development & Training	Management/Leadership Knowledge Development & Training	Acquisition and Technology Decisionmaking		3	5	Issue: Contraband coming into facilities from employees. Need: Develop 5 tools that make it possible to track contacts between inmate and employee phone numbers (though acknowledging that some countermeasures to such tools are already available).
Adv. Panel: Institutional Corrections	Issue: Apparent planned obsolescence of technology systems procured by agencies, forcing replacement (e.g., replacement parts for existing systems being phased out). Need: Collect information during procurement and analyze tools to help predict the longevity of suppliers (e.g., submission of financials at time of bid)	Doctrine, Tactics, Management and Behavioral Knowledge Development & Training	Management/Leadership Knowledge Development & Training	Acquisition and Technology Decisionmaking		3	6	Issue: Contraband coming into facilities at fence lines. Need: Develop 6 better and more-accurate video analytics technologies for video monitoring of fence lines.
Adv. Panel: Institutional Corrections	Issue: High resource, energy, and infrastructure costs. Need: Identify suppliers and explore contract opportunities for upgrading to more-energy-efficient technologies without initial costs (i.e., compensating a supplier over time with some percentage of energy savings).	Doctrine, Tactics, Management and Behavioral Knowledge Development & Training	Management/Leadership Knowledge Development & Training	Acquisition and Technology Decisionmaking		3	7	Issue: Contraband coming into facilities at fence lines. Need: Use 7 available infrared sensor-based fencing (e.g., FLIR Thermal Fence™) for perimeter security
Adv. Panel: Institutional Corrections	Issue: Technology providers of management and monitoring systems with contractual control or ownership of agency data, locking facilities to a single provider's products. Need: Make changes in contracting policy to ensure data are owned and controlled by the corrections agency, and require (if needed) conversion to standard data formats at contract conclusion for use with alternative systems	Doctrine, Tactics, Management and Behavioral Knowledge Development & Training	Management/Leadership Knowledge Development & Training	Acquisition and Technology Decisionmaking		2	8	Issue: Contraband coming into facilities through logistics systems. 8 Need: Develop higher throughput and cheaper scanning technologies to scan incoming logistical shipments to facilities
Adv. Panel: Institutional Corrections	Issue: Contraband coming into facilities by varied routes. Need: Develop doctrine for implementing a systematic approach to contraband prevention so that improvements in security at one route do not simply just displace transport to other routes	Doctrine, Tactics, Management and Behavioral Knowledge Development & Training	Management/Leadership Knowledge Development & Training	Acquisition and Technology Decisionmaking		1	9	Issue: Contraband coming into facilities transported by visitors, staff, or 9 incoming inmates. Need: Develop a single overall scanning portal suitable for detecting all types of contraband for individuals coming into the facility (e.g., millimeter wave, including explosive trace detection) at reasonable cost and a small enough footprint for use in
Adv. Panel: Community Corrections	Issue: Out-of-date computing resources at many agencies (size, speed, processing capability, communications, analysis) unable to provide needed capability. Need: Utilize new procurement or business models that provide personnel with inexpensive but up-to-date commodity computing equipment that deals with reliability and ruggedness issues, either through ruggedization leasing arrangements, or warranties.	Doctrine, Tactics, Management and Behavioral Knowledge Development & Training	Management/Leadership Knowledge Development & Training	Acquisition and Technology Decisionmaking		3	10	Issue: Contraband coming into facilities at fence lines. Need: 10 Commercialize military-developed surveillance technologies for use in the corrections environment.

Note that this table contains the source data used in the Needs Explorer and Needs Selector, so any modifications to this table will impact those other two worksheets.

## Needs PivotTables and Needs PivotCharts

These worksheets support users creating additional PivotTables and PivotCharts on all of the needs in the needs table. Users can generate tables and charts by study, first four levels of the technology taxonomy, and priority. The values input that is used for counting needs is the sum of

<sup>3</sup> Columns A and B, which are hidden from the user, include formulas needed to support the quick-search capability.

the values in the “Counter” column (column L) of the Needs Table, because this input accounts for some needs appearing in the table multiple times, as discussed above.

## Technology Taxonomy

Finally, the Technology Taxonomy worksheet contains the complete technology taxonomy used to categorize the needs, presented in outline form with the top-level headings in column A, the second-level headings in column B, and so on. It currently extends to 571 items.

## Appendix A. Spreadsheet Column Dictionary

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This appendix documents the columns in each of the worksheets within the tool. Table A.1 describes the Contents tab, which serves as the table of contents for the needs database.

**Table A.1. Contents Tab**

<b>Column Identifier</b>	<b>Column Title</b>	<b>Description</b>
A	Worksheet	Column documents the names of each of the other tabs within the spreadsheet
B	Contents	Column provides summary description of the content in each of the tabs

Table A.2 describes the Studies tab, which summarizes all studies carried out by the PCJNI. Users can apply filters to view specific studies using the down-triangle boxes to the right of each field title (in row 1).

**Table A.2. Studies Tab**

<b>Column Identifier</b>	<b>Column Title</b>	<b>Description</b>
A	Study	Shortened title of the report
B	Publication Year	Year of publication of the report documenting the workshop or panel, used to group products by year (currently 2015–2020)
C	Community of Practice	Segment of the criminal justice community that is the focus of the report (can be law enforcement, courts, corrections, or all segments, with the latter listed as “Criminal Justice (all)”)
D	Topic Type	Type of issue the panel was intended to address; can be a Tech Opportunity to take advantage of, a Tech Threat, an Operational Problem, Futures Analysis, or Community Needs of one of the communities of practice
E	Top Needs and Findings at a Glance	Reproduced summary information on the workshop or panel’s results, for quick reference, based on the content of the RAND webpage hosting the report
F	Short Title	Information on whether the event was a workshop or an advisory panel, as well as a truncated version of the title of the event; for products not based on a practitioner workshop or panel, “N/A” appears in this field
G	Additional Content	For products that included material beyond lists of prioritized needs, a summary of that content is provided in this column
H	Report Link	HTML link to the page on the RAND Corporation website where the report from the identified workshop can be downloaded
I	Report Number	RAND document number associated with the report from the identified workshop

Table A.3 describes the Studies Charts tab, which supports users making their own PivotCharts about the studies. The fields included in the PivotChart are all fields included in the Studies tab (see Table A.2.). The default PivotChart graphs studies by year and community practice, with the specific fields used to make the chart documented in the table below.

**Table A.3. Studies Charts Tab**

Column Identifier	Column Title	Description
A	Row Labels	Column contains the years during which reports were published from Initiative workshops (produced by an Excel PivotTable based on data on the Studies tab, column B)
B	Corrections	Column contains the count of reports published each year that are identified within the corrections community of practice (produced by an Excel PivotTable based on data on the Studies tab, column C)
C	Courts	Column contains the count of reports published each year that are identified within the courts community of practice (produced by an Excel PivotTable based on data on the Studies tab, column C)
D	Criminal Justice (all)	Column contains the count of reports published each year that are identified within all three criminal justice communities of practice (produced by an Excel PivotTable based on data on the Studies tab, column C)
E	Law Enforcement	Column contains the count of reports published each year that are identified within the law enforcement community of practice (produced by an Excel PivotTable based on data on the Studies tab, column C)
F	Grand Total	Column contains the total number of reports identified within all communities of practice published each year (produced by an Excel PivotTable based on data on the Studies tab, column C)

Table A.4 describes the Needs Explorer tab, which presents all needs in the form of an expandable outline. Users can click on the small “+ / -” radio buttons to the bottom left of each subheading of the outline to expand or contract the outline rows.

**Table A.4. Needs Explorer Tab**

Column Identifier	Column Title	Description
A	Taxonomy Category 1	Column contains the <u>first</u> -level categories from the technology, policy, and practice taxonomy used in the project to organize the needs developed by the workshops and advisory panels; the full taxonomy is provided on the Tech Taxonomy tab
B	[Taxonomy Category] 2	Column contains the <u>second</u> -level categories from the technology, policy, and practice taxonomy used in the project to organize the needs developed by the workshops and advisory

Column Identifier	Column Title	Description
C	[Taxonomy Category] 3	panels; the full taxonomy is provided on the Tech Taxonomy tab Column contains the <u>third-level</u> categories from the technology, policy, and practice taxonomy used in the project to organize the needs developed by the workshops and advisory panels; the full taxonomy is provided on the Tech Taxonomy tab
D	Tier	Column contains tier numbers, from 1 to 3, used to group the needs included in the taxonomy category produced by all of the panels and workshops (included in column F)
E	Study	Column contains the short title of the study (from the Studies tab, column F) used to group the needs included in the tier (column D, this tab) and Taxonomy categories (columns A–C, this tab) by the workshop/advisory panel that produced them
F	Full Need	Column contains the full text of each corresponding need

Table A.5 describes the Needs Selector tab, which allows users to click on the buttons within field boxes to show subsets of the needs that match users’ selections. Holding down the “CTRL” key while clicking allows selection of multiple buttons. Clicking on the red “X” button at the top of each field box clears the selections. On the right-hand side of the tab is a small button that says, “Click here to search needs.” Clicking on this button brings up a prompt to enter a keyword to search the needs.

**Table A.5. Needs Selector Tab**

Column Identifier	Column Title	Description
Top of sheet (colored buttons)		
	Study (gray)	Fields in this box allow clicking on specific workshops or advisory panels to only display the needs from one or a few selected events in the bottom of the sheet.
	Taxonomy Category 1 (blue)	Fields in this box allow clicking on one or more <u>first-level</u> taxonomy categories to only display needs from that selected category in the bottom of the sheet.
	[Taxonomy Category] 2 (green)	Fields in this box allow clicking on one or more <u>second-level</u> taxonomy categories to only display needs from that selected category in the bottom of the sheet.
	[Taxonomy Category] 3 (yellow)	Fields in this box allow clicking on one or more <u>third-level</u> taxonomy categories to only display needs from that selected category in the bottom of the sheet.
	Tier (red)	Fields in this box allow clicking on one or more tier identifiers (1, 2, or 3) to only display needs from the selected tier(s) in the bottom of the sheet.
	Full Need (white)	Clicking the small arrow next to the box allows filtering of needs either by their full text (using Excel’s built-in filtering capability) or by needs, including one or more words or phrases (by typing in the opened “Search” field).

Column Identifier	Column Title	Description
Bottom of sheet (rows alternately shaded blue and white)		
A	Study	This column displays the study (from the Studies tab, column F) from which the adjacent need originated. Options selected at the top of the sheet control which rows are displayed.
B	Full Need	This column displays the text of the needs based on the options selected at the top of the sheet.
C	Min of Tier	This column displays the tier ratings for the adjacent need based on its prioritization by the workshop participants.

Table A.6 describes the Needs Table tab, which presents the master table of needs. Users can filter the needs displayed by clicking on the small down-triangle button at the bottom right of each field title (in row 1).

**Table A.6. Needs Table Tab**

Column Identifier	Column Title	Description
A	<i>Hidden</i>	This column contains calculations related to spreadsheet function (do not modify).
B	<i>Hidden</i>	This column contains calculations related to spreadsheet function (do not modify).
C	Study	This column contains the shortened name of the study that identified the need in the row (from the Studies tab, column F).
D	Community of Practice	This column contains the name of the community of practice assigned to the event that identified the need in the row (from Studies tab, column C).
E	Full Need	This column contains the full text of the need itself.
F	Taxonomy Category 1	This column contains the <u>first-level</u> taxonomy category assigned to the need. See the Tech Taxonomy tab for the complete taxonomy.
G	<i>[Taxonomy Category] 2</i>	This column contains the <u>second-level</u> taxonomy category assigned to the need.
H	<i>[Taxonomy Category] 3</i>	This column contains the <u>third-level</u> taxonomy category assigned to the need.
I	<i>[Taxonomy Category] 4</i>	This column contains the <u>fourth-level</u> taxonomy category assigned to the need.
J	Tier	This column contains the prioritization tier (1, 2, or 3) assigned to the need by the participants in the panel or workshop that identified it.
K	ID	This column contains a stable identification number assigned to the instance of the need in the spreadsheet (one number per row). For needs appearing more than once because they were assigned to multiple taxonomy categories, multiple row ID numbers are associated with the need.
L	Counter	For needs that were assigned as falling into more than one taxonomy category (and that therefore appear in multiple rows),

Column Identifier	Column Title	Description
		<p>this column contains a number between 0 and 1 that reflects the number of rows in which the need appears:</p> <ul style="list-style-type: none"> <li>• 1 = a single appearance in one row, assigned to a single taxonomy category</li> <li>• 0.5 = two appearances, assigned to two taxonomy categories</li> <li>• 0.33 = three appearances, assigned to three categories</li> <li>• 0.25 = four appearances, assigned to four categories.</li> </ul> <p>The counter supports summing needs in different categories to provide summary statistics without counting single needs multiple times.</p>
M	Quick search for:	This column only acts as a label for adjacent quick-search box.
N	Orange-shaded cell in row 1	Typing of a term in this cell will create a filtered list immediately below it in the same column of the first 25 needs containing the word or phrase. The example shown is for “Contraband.”

Table A.7 describes the Needs Pivot tab, which is a customizable PivotTable of all fields shown in the Needs Table tab (see Table A.6). The default table shows a breakdown of all needs by the first two technology taxonomy levels and community of practice. The table has been colored to show which taxonomy/community of practice combinations had higher percentages of needs. (Deeper green indicates higher percentages.)

**Table A.7. Needs Pivot Tab**

Column Identifier	Column Title	Description
A	Taxonomy Category 1	This column contains the <u>first-level</u> taxonomy category defining the first-category breakdown for the PivotTable of needs by community of practice presented in the tab.
B	[Taxonomy Category] 2	This column contains the <u>second-level</u> taxonomy category defining the second-category breakdown for the PivotTable of needs by community of practice presented in the tab.
C	Corrections	This column presents the percentage of all of the needs that fall into the combination of the first- and second-level categories (columns A and B) and the <u>corrections</u> community of practice.
D	Courts	This column presents the percentage of all of the needs that fall into the combination of the first- and second-level categories (columns A and B) and the <u>courts</u> community of practice.
E	Criminal Justice (all)	This column presents the percentage of all of the needs that fall into the combination of the first- and second-level categories (columns A and B) and the <u>criminal justice (all)</u> community of practice.
F	Law Enforcement	This column presents the percentage of all of the needs that fall into the combination of the first- and second-level categories (columns A and B) and the <u>law enforcement</u> community of practice.
G	Grand Total	This column presents the percentage of all of the needs that fall into the combination of the first- and second-level categories

Column Identifier	Column Title	Description
(columns A and B) <u>across all communities of practice.</u>		

Table A.8 describes the Needs Charts tab, which is a customizable PivotChart of all fields shown in the Needs Table tab (see Table A.6). The default table shows a breakdown of needs by study and priority tier.

**Table A.8. Needs Charts Tab**

Column Identifier	Column Title	Description
A	Studies	This column includes a row for each study workshop or advisory panel (from the Studies tab, column F).
B	[Tier] 1	This column includes the total number of <u>tier 1</u> needs identified in each workshop or advisory panel.
C	[Tier] 2	This column includes the total number of <u>tier 2</u> needs identified in each workshop or advisory panel.
D	[Tier] 3	This column includes the total number of <u>tier 3</u> needs identified in each workshop or advisory panel.
E	Grand Total	This column includes the total number of needs identified in each workshop or advisory panel.

Finally, Table A.9 describes the Tech Taxonomy tab, which presents all levels of the technology taxonomy for categorizing needs.

**Table A.9. Tech Taxonomy Tab**

Column Identifier	Description
A	This column includes the <u>first-level</u> taxonomy categories of the technology, policy, and practice taxonomy.
B	This column includes the <u>second-level</u> taxonomy categories of the technology, policy, and practice taxonomy.
C	This column includes the <u>third-level</u> taxonomy categories of the technology, policy, and practice taxonomy.
D	This column includes the <u>fourth-level</u> taxonomy categories of the technology, policy, and practice taxonomy.
E	This column includes the <u>fifth-level</u> taxonomy categories of the technology, policy, and practice taxonomy.
F	This column includes the <u>sixth-level</u> taxonomy categories of the technology, policy, and practice taxonomy.

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