RESEARCH NOTE

Abstract

The Counter-Insider Threat (CInT) mission includes protecting organizations against concerning conduct that may escalate to harmful behaviors. The Threat Lab developed and pilot tested a tool to help supervisors identify and effectively respond to concerning behaviors. This research note describes the pilot testing of this tool, identifies areas for improvement, and discusses recommendations and next steps.

the ThreatLab
Integrating Research Into Practice

About The Threat Lab

The Defense Personnel and Security Research Center (PERSEREC) founded The Threat Lab in 2018 to realize the Department of Defense (DoD) Counter-Insider Threat Program Director's vision to incorporate the social and behavioral sciences into the mission space. Our team is headquartered in Seaside, California, and includes psychologists, sociologists, policy analysts, computer scientists, and other subject matter experts committed to workforce protection.

Evaluating a Supervisor Guide to Concerning Conduct

OPA Report No. 2021-109 • PERSEREC-RN-21-16 • January 2022

Zachary G. Van Note, Kayla J. Pomeranz, Janet G. Bayer, and Leissa C. Nelson

Introduction

Identifying troubled employees before they engage in destructive behaviors helps keep the workforce and the organization safe. By providing first-line supervisors with tools to help recognize and respond to early signs of distress and potential threats, we can help them counter problems as they arise and provide timely support to employees in need. A 2019 PERSEREC study[1] found that supervisors wanted more information to help them better identify and handle concerning behaviors (i.e., behaviors that indicate the potential for negative or destructive acts such as misuse of Government property, threats of violence, and abrupt behavior changes).

In a 2020 DoD-sponsored project, PERSEREC developed the Concerning Conduct Guide for Supervisors web application[2] to address this need. The browser-based application (app) provides detailed information about concerning behaviors and describes resources available to supervisors as well as resources that supervisors can recommend to employees. The app aims to supplement insider threat training and help supervisors mitigate insider threats by giving them intervention tools they can use to help troubled employees before their concerning behavior escalates to destructive acts.

The app guides the user through a mixture of learning modules and other resources available to them and their employees providing considerations, examples, and policy details about each of the behaviors. Users can then select the relevant concerning behaviors

[1] Nelson, L. C., Beneda, J. G., McGrath, S. M., & Youpa, D. G. (2019). *Enhancing supervisor reporting of behaviors of concern* (OPA Report No. 2019-033, PERSEREC-TR-19-03). Defense Personnel and Security Research Center/Office of People Analytics. DTIC: AD1075281

[2] McGrath, S. M., Neville, A., Prina, D. P., & Nelson, L. C. (2020). *Building a supervisor guide to concerning conduct* (OPA Report No. 2020-107, PERSEREC-RN-20-08). Defense Personnel and Security Research Center/Office of People Analytics. DTIC: AD1115607

and generate a custom report of Supervisor Resources with organizational contacts and potential next steps to address the problematic behavior (see Figure 1). The Employee Resources page describes the organizational resources available for referral and how those resources can help employees. Learning Modules provide the context for understanding concerning behaviors, addressing those behaviors, and identifying barriers to addressing them. Throughout the application, Print Resource buttons make it easy to print and share guidance. Note that no Personally Identifiable Information (PII) is ever entered or stored in the application.

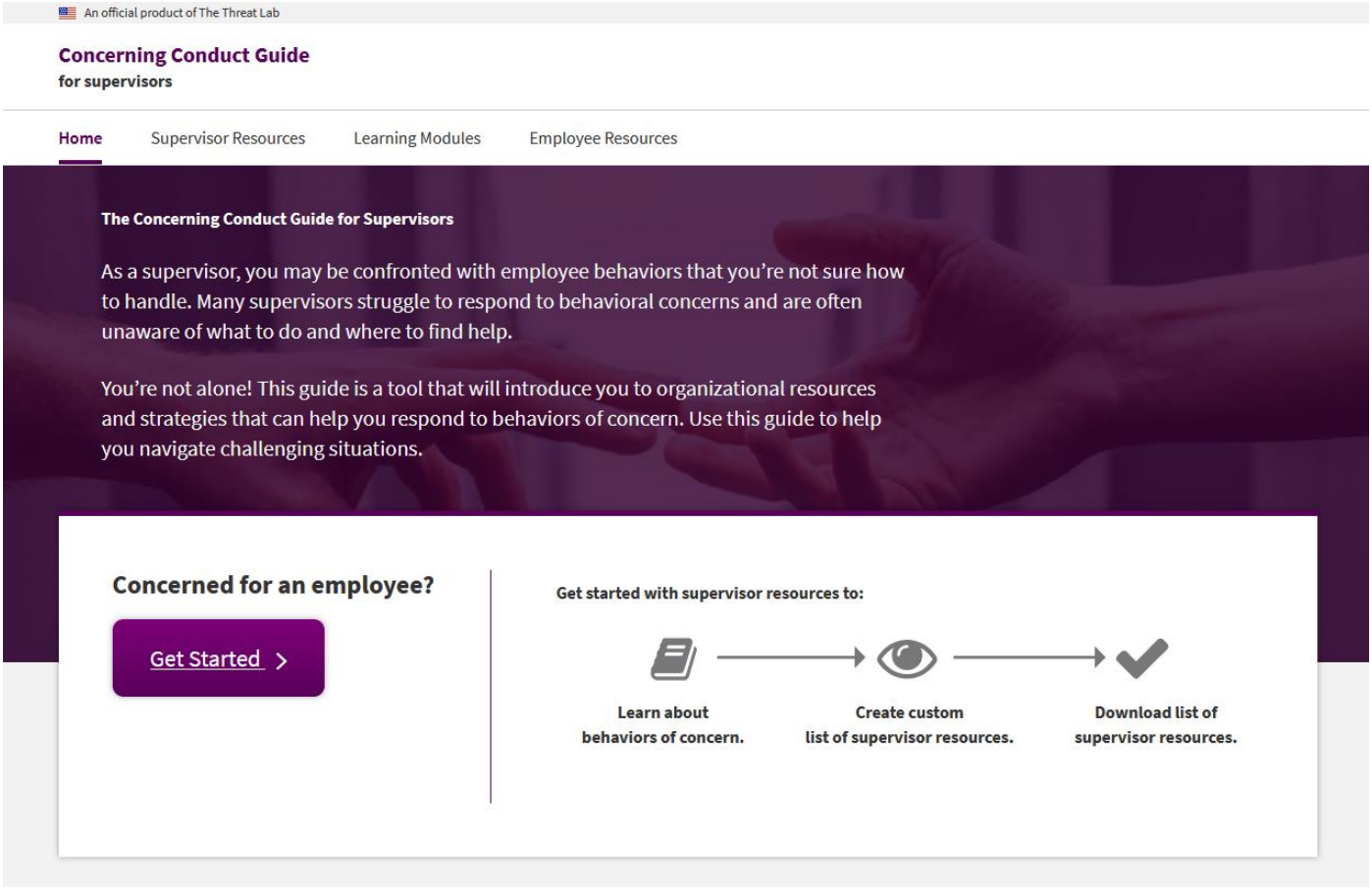

Figure 1. Concerning Conduct Guide Home Page

Current Project

This project was sponsored by the National Insider Threat Task Force (NITTF) and had two primary goals. The first was to conduct a pilot test of the Concerning Conduct Guide for Supervisors app to evaluate its usability and content usefulness. The second goal was to develop a new version of the app that Government agencies could customize to reflect their own organizational policies and resources. The version of the app that we pilot tested was developed through DoD-funded projects, so it focused on DoD-specific terms, roles, and policies. Making the app easily customizable would allow any organization to tailor it to their unique needs. We also determined areas for improvement to the app through user surveys, website usage metrics, and user interviews. We then identified and implemented recommended changes to the app to enhance its functionality and applicability to the target audience.

Method

We employed a mixed methods approach to gather a variety of data points. These data were reviewed to gain insight into usage patterns, content quality, and user experiences within the app. We recruited multiple participants and developed a communication plan to encourage their involvement throughout the pilot test period. We evaluated the app's usability through several usage statistics tracked by Crazy Egg software and Google Analytics. We also collected user feedback through in-app surveys and follow-up interviews.

Pilot Test Participants

We recruited participants from several Government agencies, focusing primarily on organizations that PERSEREC had worked with in the past on other projects. A call for participants also went out in general communications from The Threat Lab, including *The Insider* newsletter. Participants included supervisors from a variety of DoD and other Government agencies and their contractors. We sent requests for participation to 7 supervisors from the U.S. Navy, 1 from the Office of the Director of National Intelligence (ODNI), and 23 from the U.S. Army. These individuals were encouraged to forward the pilot information to others. To increase the response rate, we later asked professional contacts of the Threat Lab to participate. PII about participants was not captured or stored in the application. Altogether, 37 unique visitors reviewed the app.

Communications

To ensure the audience was engaged at each stage of the pilot test, we implemented a communication plan to raise awareness and promote participation. We sent periodic emails to participants throughout the project, informing them of the practical application of the app and reminding them to complete the survey. We also sent emails with scenarios involving concerning conduct to encourage participants to review the app in order to learn about recommended responses to these situations. Toward the end of the pilot period, we sent emails requesting participation in follow-up interviews to the Navy, DNI, and Army participants.

Crazy Egg

Crazy Egg, a heat map tool, provided information on user clicks and behavior flow in the app. These data allowed us to test app features and identify potential problems with the app design by providing data on user behavior. For example, one metric was rage clicks, which capture repeated user clicks on an element, indicating it is not operating as the user expects. We also examined the load time of various pages, page errors, bounce rate (the percentage of users who only view one page before leaving the app), and dead clicks. Dead clicks are clicks made by a user on a feature that does not produce the expected response from the page, such as when a user clicks on text that they believe is a link but is not. The metrics provided by Crazy Egg indicate the quality of user experience and the performance of app features.

Google Analytics

We used Google Analytics to recognize trends and collect additional information on user interactions within the app. While informative, the numbers primarily serve as a baseline against which to assess future metrics. The Google Analytics metrics included the following:

- Number of unique visitors—indicates the reach of the app
- Average engagement time per session—a measure of engagement with the content
- Engaged sessions per user—denotes extent to which users return to the app
- Engagement rate—shows the proportion of sessions in which a user interacts with the content
- Page views—designates the amount of content reviewed
- Top pages visited—identifies pages with the most interest

Surveys

We used surveys to gather user responses to specific question about the usefulness of the app's content, its practical application for supervisors, and the overall performance of the app. We created several surveys (see Appendix A for the questions included in each survey) to assess user experience with the different resources in the app. We designed a general in-app survey to evaluate the app's overall content and ease of use. This general survey had 16 questions and included both closed- and open-ended response options. We prompted participants to complete the general survey via both an in-app pop-up and email requests. A "leave feedback" button was always displayed within the app so that participants had the option of leaving a quick comment or completing the general survey at a later time.

Short surveys appeared after a user clicked any of the three learning modules on the main app page. Each of these three surveys included two questions about the content usefulness and possible improvements for that particular learning module. Another survey with similar questions appeared after a user had spent 60 seconds[3] on the Supervisor or Employee Resources pages or clicked an "improve these resources" button. These two surveys included four questions about prior knowledge of the behaviors described in the app and suggestions for future use of the app. We collected survey responses with Smartsheet.com and performed a quantitative analysis on responses to the closed-ended questions with Microsoft Excel. Responses to open-ended questions were content-coded.

Interviews

We conducted interviews with five managers from five different Federal agencies and private industry to collect more detailed user feedback and recommendations for improvement. We did not receive any responses to interview requests from the initial sample of participants and therefore asked professional contacts of the Threat Lab to review the app and participate in interviews. We developed an interview protocol that focused on the usefulness of the content, applicability of the content for identifying and responding to concerning conduct, the app's technical ease of use, and suggestions for future iterations of the app. After interviewing the participants, we reviewed the interview notes and conducted a content analysis that categorized responses by the content theme.

Results

Crazy Egg and Google Analytics metrics indicate that the app largely performs as intended but the design of some features could be improved. Based on survey and interview findings, most users found the app useful but recommended several changes to the content.

3 During the pilot test, we modified the survey prompt parameters to improve response rates. To encourage a higher survey participation rate, we decreased the amount of time at which survey prompts appeared on the screen from 90 seconds to 60 seconds.

Crazy Egg Results

Usage patterns tracked from late January 2021 to early June 2021 on Crazy Egg demonstrated areas for site improvements. Rage clicks (repeated clicks on an element), in particular, indicated areas to investigate further. Figure 2 illustrates rage clicks on the home page with each red dot indicating a repeated click. The location on this page that had the most rage clicks was the "Get Started" button with 38%. The landing pages for Supervisor Resources and Learning Modules (not shown here), along with the home page, received an overall rage click rating of "poor," meaning rage clicks constituted 20% or more of all clicks. All pages were rated as "good" for dead clicks, with the exception of the home page. After further examination, it appears that a dynamic feature on that page did not register properly with Crazy Egg. Few dead clicks registered on the home page outside of this issue, so we believe the home page would also rate as "good" for dead clicks.

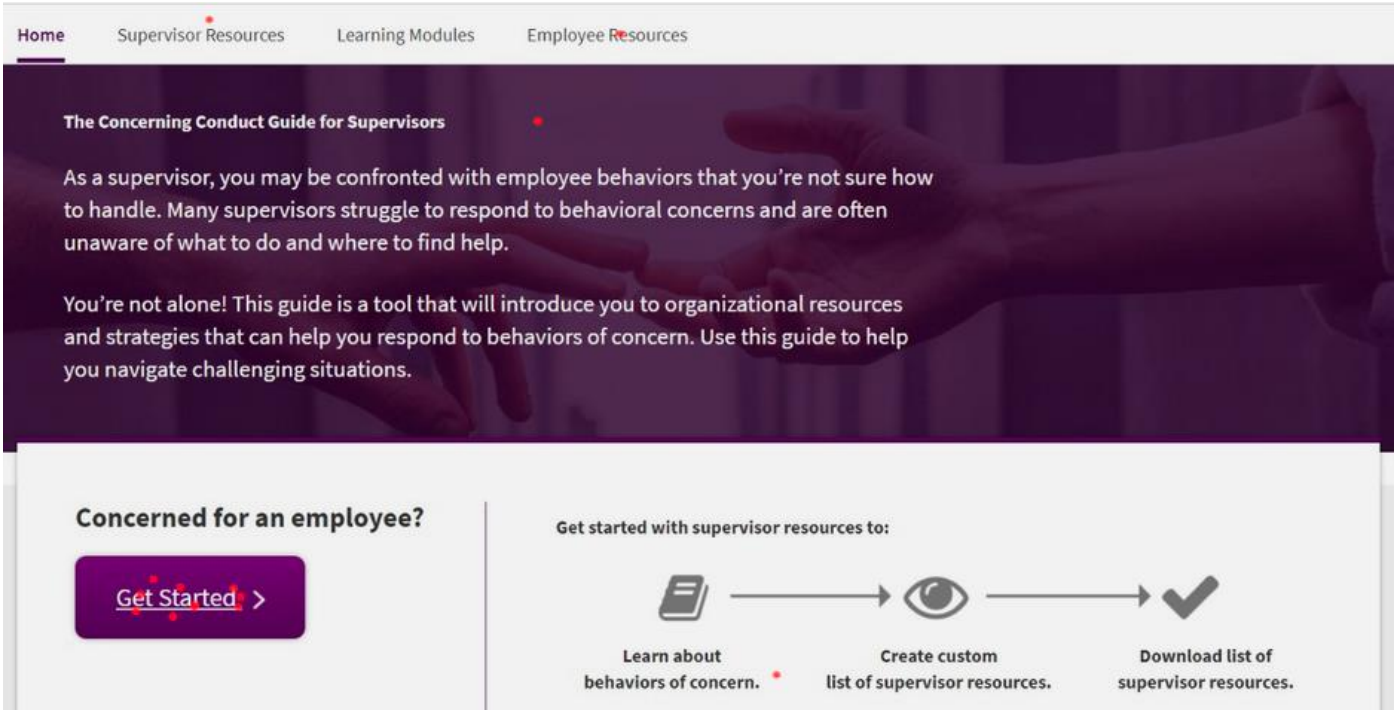

Figure 2. Home Page Rage Clicks

It is not completely clear from the data gathered and follow-up interviews why Crazy Egg registered so many rage clicks. The pages may not have refreshed as fast as users expected, prompting additional clicks, but more investigation is needed to confirm this assumption. A direct observation usability study may help explain the many extra clicks on the "Get Started" button. Most of the other metrics suggested successful user navigation and app performance. Each examined page loaded relatively quickly with a median load time under 0.40 seconds. The bounce rate for these pages was low (below 20%), indicating that most users engaged with more than one page before leaving the app. Most of the pages operated well and had no performance errors.

Google Analytics Metrics

Table 1 displays the Google Analytics usage metrics gathered from late January 2021 to early June 2021 across 37 unique visitors. These metrics are commonly examined to evaluate website performance. In general, the more time a user spends on the site (average engagement time), the more pages they view, and the more times they return (engaged sessions per user), the better the site

is performing. Engagement time for the app averaged 3 minutes, 52 seconds, overall and 1 minute, 47 seconds, per session. The number of engaged sessions per user averaged 1.8, and the app had an overall engagement rate of 82.5%, indicating high interaction with the app. Each user viewed 8.7 pages on average, and the top pages visited were the home page, Welcome page, and Supervisor Resources page.

Table 1. Google Analytics Results

Unique Visitors: 37	**Top Pages Visited:** • Homepage • Welcome Page • Supervisor Resources • Behaviors of Concern
Average Engagement Time: 3 minutes, 52 seconds	
Average Engagement Time Per Session: 1 minute, 47 seconds	
Average Engaged Sessions Per User: 1.8	
Engagement Rate: 82.5%	
Average Pages Viewed Per User: 8.7	

Although the Google Analytics results provide useful information about the way users interacted with the app, we note a few caveats in interpreting the results. First, commonly available benchmarks for Google Analytics generally apply to sites with larger audiences in specific industries, so they are not appropriate as benchmarks for our results. Instead, because this was a limited pilot test, the results in Table 1 should be considered a baseline against which to assess future performance. Second, our results may have been affected to a small degree by the research team using the app during the pilot period since there was no way to exclude specific users from the results. Third, if javascript was disabled in any user's browser, it could have affected our results. Unfortunately, we have no way to evaluate this further.

Survey Findings

We received 33 responses to the surveys. Table 2 shows the number of responses to each survey. For the general in-app survey, all respondents said they would recommend the app to their colleagues and, on average, found the content useful. Overall, respondents rated the custom list of supervisor resources from "useful" to "very useful." When asked about the ease of navigating the app, respondents, on average, rated the app slightly lower than "easy" at 3.8 on a five-point Likert scale, with 1 being "very difficult" and 5 "very easy." Regarding prior knowledge of the concerning behaviors, the average response fell in between knowing about "all" or "some" of the behaviors.

Table 2. Number of Survey Responses Per Survey Type

General Survey: 7	**Learning Module Surveys** • "A Guide to Concerning Behavior": 2 • "Supervisor Actions": 4 • "Employee and Organizational Wellness": 4
Supervisor Resources Survey: 10	
Employee Resources Survey: 5	
"Leave feedback" comments: 1	

Although many of the survey respondents had previous familiarity with information in the app, all but one said they would refer back to the app when a workplace problem arose. The learning module survey responses indicated that users generally found the content helpful in addressing the goal of each module despite prior familiarity with some of the material. Two respondents to these surveys

requested that additional resources be added. On average, respondents found the Employee and Supervisor Resources useful, although all respondents already knew about some or all of the Employee Resources listed.

We recommend interpreting the survey results with caution for several reasons. Because user data were not recorded, we cannot discern the number of unique respondents to each survey. Neither could we track how many people were solicited to participate since participants were encouraged to share the participation request with others in their organizations. We originally developed content-specific surveys to gather information about specific app features but using multiple surveys may have discouraged full participation in each survey.

Interview Findings

The findings from the five interviews echoed many of the survey findings. Most interview participants found the app very useful and easy to use. They appreciated the behavioral definitions and the app's simplicity of use. Suggestions for improvement included placing the All Engagement Resources content in a more central location in the app and devising methods to promote leadership adoption and supervisor usage of the app.

Both survey and interview participants recommended clarifying the intended audience in the app because policies and suggested actions differ for contractors, Government, and military employees. Survey and interview participants suggested enabling easier access to the resources. Some users had difficulty viewing the videos embedded on the page. There was an alternative link for users who have the primary video link blocked on their Government network, but some users did not see that option. Some users also thought that the learning modules did not sufficiently expand on the content already found on the site or the information they already knew as supervisors. Both survey and interview participants also proposed providing case studies or scenarios to give supervisors examples of how to appropriately respond to concerning behavior.

Limitations

Despite several attempts to increase participation in the pilot test, we experienced a relatively low response rate. We sent additional participation requests to professional contacts but were not able to significantly increase the number of participants. Other efforts to boost participation included publicizing the pilot in OPA's weekly newsletter, addressing it during meetings, and continuing follow-up communication. Due to the small sample size, results should not be generalized across all users.

Conclusion

The pilot test of the Concerning Conduct Guide for Supervisors web application v1.0 confirmed that supervisors found the tool informative and easy to use and identified a number of potential improvements. Using this input, the development team began work on a new v2.0 iteration of the web app, with improved performance, security, and maintainability. The updated app uses a combination of technologies that provides a smoother user experience and loads more quickly than a traditional web application. We also present recommendations for future integration.

The new design allows for more advanced features, such as the ability to download and revisit customized Supervisor Resources. By using current industry-standard software frameworks, the updated app can easily be integrated into other modern systems, including Microsoft SharePoint.

It is very secure technology, making it difficult for hackers to compromise the system. The new design includes a content editor, which makes it faster and easier to add and customize content (e.g., content that reflects policies and resources of the target organization) without the need for HTML coding or other programming skills. No PII is stored in the database to preserve the privacy of users. Appendix B includes details on the technologies used, including more details on the reasons these technologies were selected and what kind of software and web server will be needed to deploy this system in an organization.

In addition to these baseline improvements to the app, we developed several recommendations based on the pilot test results. We implemented these recommendations during the current task order:

- Allow organizations to easily update content and contact information based on their organizations' structure and policies.
- Ensure that all buttons respond quickly to one click, especially the main calls to action on each page, including Get Started on the home page.
- Put the All Engagement Resources in a more prominent location in the app.
- Add a way for users to "Share this resource."
- Indicate the target audience on the site (e.g., Government employees, DoD employees).

At the completion of this project (which will coincide with the publication of this Research Note), a final version of the app (v2.0), with the existing DoD-specific content, will be hosted on The Threat Lab website. In addition, v2.0 will be available as a customizable package that can be hosted by any interested organization and tailored to their specific needs. Interested organizations will be able to take the base v2.0 and modify concerning behavior, supervisor resource, and employee resource information using a built-in content management system and an easy word processor interface. To host the application, an organization will need their own web server and database. The rollout of any customized version of the app should be pilot-tested within the client organization.

Future Directions

Based on our results, we recommend the following steps be considered for future research. These recommendations require additional funding or organization-specific input:

- Test all media (video, training modules) on the intended network(s) to ensure they will play properly without workarounds.
- Add more detailed content to the learning modules.
- Add scenarios or case studies to enhance and/or assess user knowledge.
- Update the references to include more direct links to resources and more accessible resources that do not require subscriptions or special access.
- Revise some of the content to include more "action" based language
- Gather more user testing data after completion of the new features.

Acknowledgments

We would like to thank the team of researchers, designers, programmers, editors, and subject matter experts from Peraton, Northrop Grumman, and Written LLC for their contributions to the evaluation and updates to the Concerning Conduct Guide for Supervisors Web Application.

Appendix A

General Survey

1. Are you employed by a Department of Defense organization?
    - Yes
    - No

2. What is your role in the organization?
    Response: _____

3. How long have you been in this job?
    - Less than 1 year
    - 1-3 years
    - 4-6 years
    - 7 or more years

4. To what extent did you find the application content useful?
    - Not at all useful
    - Not useful
    - Neither useful nor not useful
    - Useful
    - Very useful

5. In what ways could the content be improved?
    Response: _____

6. Is there information that would be useful to you which was NOT presented in this application? If so, please describe.
    Response: _____

7. Did you learn anything that you didn't know before?
    - Yes
    - No

8. To what extent did you find the custom list of supervisor resources useful?
    - Not at all useful
    - Not useful
    - Neither useful nor not useful
    - Useful
    - Very useful
    - I wasn't aware of these resources

9. Prior to this pilot, to what extent did you know about the Concerning Behaviors described in this application?
    - Did not know about most of the Concerning Behaviors
    - Knew about some but not all of the Concerning Behaviors
    - Knew about all of the Concerning Behaviors

10. To what extent do you feel comfortable identifying concerning behavior?
    - Very uncomfortable
    - Uncomfortable
    - Neither comfortable nor uncomfortable
    - Comfortable
    - Very comfortable

11. To what extent do you feel better prepared to handle concerning conduct after using this application?
    - No better prepared than when I started
    - Somewhat better prepared, but not proficient in recognizing and responding to concerning conduct
    - Significantly better prepared, and proficient in recognizing and responding to concerning conduct

12. Does your organization have people in all of the roles mentioned in the application, such as an HR Labor Management and Employee Relations Specialist, Security Manager, and Insider Threat Working Group?
    - Yes
    - No
    - Unsure

13. Do you know how to contact them?
    - Yes
    - No

14. How easy was the application to navigate?
    - Very difficult
    - Difficult
    - Neither easy nor difficult
    - Easy
    - Very easy

15. In what ways could the usability of the application be improved?
    Response: _____

16. To what extent did you find the Overview Video and Quick Start Guide on the home page helpful?
    - Not at all helpful
    - Not helpful
    - Neither helpful nor not helpful
    - Helpful
    - Very helpful
    - Did not use the Overview Video or Quick Start Guide

17. Would you recommend the application to your colleagues?
    - Yes
    - No

Site-Specific Pop-Up Surveys

1. Supervisor Resources
   Prior to this pilot, to what extent did you know about the Supervisor Resources included in this application?
   - Did not know about any of the Supervisor Resources
   - Did not know about most of the Supervisor Resources
   - Knew about some but not all of the Supervisor Resources
   - Knew about most of the Supervisor Resources
   - Knew about all of the Supervisor Resources

   To what extent did you find the Supervisor Resources useful in providing strategies to respond to concerning behavior?
   - Not at all useful
   - Not useful
   - Neither useful nor not useful
   - Useful
   - Very useful

   In what ways could these resources be improved?
   Response: _____

   Would you refer back to these resources when a workplace problem arises?
   - Yes
   - No

2. Employee Resources
   Prior to this pilot, to what extent did you know about the Employee Resources included in this application?
   - Did not know about any of the Employee Resources
   - Did not know about most of the Employee Resources
   - Knew about some but not all of the Employee Resources
   - Knew about most of the Employee Resources
   - Knew about all of the Employee Resources

   To what extent did you find the Employee Resources helpful in addressing potential employee issues?
   - Not at all useful
   - Not useful
   - Neither useful nor not useful
   - Useful
   - Very useful

   In what ways could these resources be improved?
   Response: _____

   Would you refer back to these resources when a workplace problem arises?
   - Yes
   - No

Learning Module Surveys

1. "A Guide to Concerning Behavior":
   To what extent did you find this module helpful in learning to identify employee behaviors of concern?
   - Not at all helpful
   - Not helpful
   - Neither helpful nor not helpful
   - Helpful
   - Very helpful

   In what ways could content be improved for this module?
   Response: _____

2. "Supervisor Actions":
   To what extent did you find this module helpful in learning how to address concerning employee behaviors?
   - Not at all helpful
   - Not helpful
   - Neither helpful nor not helpful
   - Helpful
   - Very helpful

   In what ways could content be improved for this module?
   Response: _____

3. "Employee and Organizational Wellness":
   To what extent did you find this module helpful in learning how to deal with barriers to taking action when addressing concerning conduct?
   - Not at all helpful
   - Not helpful
   - Neither helpful nor not helpful
   - Helpful
   - Very helpful

   In what ways could content be improved for this module?
   Response: _____

Appendix B

The *Concerning Conduct Guide for Supervisors App* v2.0 was updated based on feedback from users. It runs on a modern "stack" of open source technology and implements key features that will make it more customizable. The content management system that is now built into v2.0 allows for easy entry of organization-specific branding, policy, and contact information. The new high-performance application can be installed quickly on most intranets and can be maintained by any personnel without a need for web programming skills.

Technology Overview and Implementation Details

We identified five overarching goals for the design and development of v2.0 of the web application. We wanted v2.0 to be

- **Easy To Customize:** To allow organizations to modify certain sections of content for easier maintenance and future customization
- **Readily Portable:** To allow for implementation on most organizations' intranets, including common web servers, SharePoint 2013+, and cloud environments, including Amazon Web Services and Microsoft Azure
- **Private:** To provide useful functionality without requiring any PII to be entered or stored
- **Secure:** To meet U.S. Government and DoD security requirements without sacrificing performance
- **Performance:** To build a robust web application that can support many concurrent users without any noticeable lags in performance

We considered a number of off-the-shelf content management systems, but each had considerable drawbacks that conflicted with some of the goals we established. Instead, we decided on a lightweight solution based on open source web software, including Node.js, React.js, and MySQL. This technology stack is widely used, with organizations like LinkedIn, NASA, Netflix, and PayPal using some or all of these components.

Node.js was the foundation for the server-side application programing interface (api). Node.js is used as a modern standard to develop a wide range of web applications and provides many advantages, including asynchronous functionality, fast code execution, and no buffering of individual data. Utilizing Node.js in the application allows seamless data transfer from the MySql database server to the front-end application without compromising security.

React.js framework was used to build the front end of the application, which handles the user interface and user interactions. React uses a virtual DOM and handles loading of components differently than traditional JavaScript, making it faster and more responsive. Using Node and React provides a platform that allows for very fast page loading and customizable content.

MySQL database server is a widely used open-source solution that provides excellent performance and security. It works seamlessly with Node.js and React.js and acts as the database for the customizable content; it does not capture any user information. Although a database is used to store content on the site, no user information is stored in the database. We have devised methods to allow users to save and return to customized reports of concerning behaviors and accompanying resources without storing any PII. MySQL could be switched out for other standard databases like Microsoft SQL Server, if needed.

The Concerning Conduct Guide for Supervisors App v2.0 does require a web server that supports the above technologies, but these are standard technologies on many intranets and other DoD IL5-compliant web hosting providers. Web servers vary by organization and the technology platforms they work with, but Node.js, React.js, and MySQL can be configured to work seamlessly in most environments. This is especially true in virtually all cloud environments like Amazon Web Services and Microsoft Azure Cloud because they can support a variety of technologies. Traditional web servers like Microsoft IIS (Internet Information Services) and Apache HTTP Server can also support this technology stack. The application can also work inside other popular systems, like Microsoft SharePoint. In all cases, some configuration and setup will be needed to create a new instance of the system on a particular organization's network.

Building for Accessibility

Section 508 of the Rehabilitation Act of 1973 requires that all Federal agencies make electronic systems accessible to people with disabilities. The Concerning Conduct Guide for Supervisors web application was built from the beginning to be accessible to all users, and the app passes all tests for Section 508 compliance. All app updates have been built with accessibility in mind, and future enhancements will continue this support.