Development of a SMS Rollout Plan and Evaluation

Report Number: KTC-24-33

DOI: https://doi.org/10.13023/ktc.rr.2024.33

Kentucky Transportation Center
College of Engineering, University of Kentucky, Lexington, Kentucky

in cooperation with
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University of Kentucky

Research Report
KTC-24-33

Development of a SMS Rollout Plan and Evaluation

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Commonwealth of Kentucky

June 2024

1. Report No. KTC-24-33	**2. Government Accession No.**	**3. Recipient's Catalog No**	
4. Title and Subtitle Development of a SMS Rollout Plan and Evaluation		**5. Report Date** June 2024	
		6. Performing Organization Code	
7. Author(s): Gabriel B. Dadi, Hala Nassereddine, Farshid Taherpour, Salena Pham		**8. Performing Organization Report No.** KTC-24-33	
9. Performing Organization Name and Address Kentucky Transportation Center College of Engineering University of Kentucky Lexington, KY 40506-0281		**10. Work Unit No. (TRAIS)**	
		11. Contract or Grant No. SPR 23-641	
12. Sponsoring Agency Name and Address Kentucky Transportation Cabinet State Office Building Frankfort, KY 40622		**13. Type of Report and Period Covered**	
		14. Sponsoring Agency Code	
15. Supplementary Notes Prepared in cooperation with the Kentucky Transportation Cabinet			
16. Abstract Many state transportation agencies have introduced safety management systems (SMSs) to improve employee safety and health programs. These systems let employees quickly access safety and health policies, procedures, training, responsibilities, resources, and incident reporting tools, often electronically. Instituting a SMS is a critical step in adopting a proactive, data-driven approach to organizational safety. The Kentucky Transportation Cabinet Secretary's Office of Safety (SOS) worked with Kentucky Transportation Center (KTC) to acquire, adapt, and rollout the Boosting Occupational Outcomes in Transportation Safety (BOOTS) system, a new SMS. Researchers assisted KYTC by conducting pre-rollout focus groups, helping to bring the system online, providing ongoing support, and conducting a user survey to understand what improvements can be made. While roadblocks were expected and encountered, researchers were able to identify problematic issues early and recommend interventions.			
17. Key Words Occupational Safety, Reporting, Web Tool, Policy and Procedures		**18. Distribution Statement** Unlimited with approval of the Kentucky Transportation Cabinet	
19. Security Classification (report) Unclassified	**20. Security Classification (this page)** Unclassified	**21. No. of Pages** 90	**19. Security Classification (report)**

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Executive Summary

The Occupational Safety and Health Administration (OSHA) and the International Organization for Standardization (ISO) recommend that organizations, such as state departments of transportation, use safety management systems (SMSs) as a single point of access for safety and health policies, procedures, training, responsibilities, and resources. Employees at all levels of an organization can use an SMS to access safety-related information that will help them execute their job duties safely and effectively.

The Kentucky Transportation Cabinet (KYTC) has long maintained policies and procedures focused on employee safety and health. But administration of the employee safety program has relied largely on paper-based reporting and documentation. This approach is often reactive, prevents the agency from responding quickly to emerging issues, and is not conducive to data-driven decision making. To improve its employee safety and health program, KYTC commissioned researchers from the Occupational Safety and Health program at the Kentucky Transportation Center (KTC) to assist with rolling out the Boosting Occupational Outcomes in Transportation Safety (BOOTS) system, a new SMS. As part of this effort, KTC researchers conducted a literature review, developed a strategic rollout plan, convened pre-rollout focus groups, reviewed training materials, analyzed data, and surveyed users after the rollout. The goal of the KTC's effort was to grow awareness of the BOOTS system, minimize roadblocks to its use, and increase the likelihood of it achieving long-term success.

The rollout and post-implementation survey highlighted the importance of taking a holistic approach when adopting new technologies (see Appendix C for full survey results).Using the People, Process, Technology Framework to guide analysis of the BOOTS system rollout, the research team advanced several recommendations to make the system more effective, accessible, and user friendly:

People

- Develop more targeted guidance tailored to individual user groups and their job duties.
- Hold trainings in interactive, face-to-face settings (e.g., through a potential Safety Academy).
- Raise awareness of the BOOTS system and clearly communicate expectations for its use.

Process

- Strengthen user privacy protections.
- Develop a method of confirming attendance/participation in job briefings (e.g., signature verification).
- Improve BOOTS system accessibility in field and office settings (e.g., acquiring additional iPads for maintenance barns, strengthening device connectivity).

Technology

- Simplify and improve the BOOTS system interface.
- Enhance data security.
- Address lingering system performance issues and improve support services.

The BOOTS system represents a significant advance that improves the KYTC Secretary's Office of Safety capabilities, responsiveness, and ability to make data-driven decisions related to employee safety. A majority of users surveyed said the system has the potential to bolster safety throughout the Cabinet. While ambitious, large-scale changes in technological systems can pose challenges in a large organization like KYTC, continuing to refine the BOOTS system based on recommendations outlined in this report will increase efficiencies and improve employee safety.

Chapter 1 Background

1.1 Introduction

The construction and maintenance industry is well known for its high rate of occupational health and safety (OHS) issues worldwide, which are attributed to the complex and physically demanding nature of construction activities (Taherpour et al. 2024). According to global statistics, the rate of fatalities in the construction industry is three times higher and the rate of non-fatal injuries two times higher than other industries (Pham et al. 2021). Across the United States, the construction industry was responsible for 20% of all worker fatalities in 2019, amounting to 1,061 deaths. This represents the highest number of fatalities since 2007, when 1,024 workers lost their lives (Namian et al. 2022). Compared to developed countries, accident rates are higher in developing countries. For instance, the construction industry employed 12% of the workforce, but it is responsible for 45% of the nation's reported work-related fatalities, which is 2.5 times higher than developed countries (Soltanzadeh et al. 2019). These statistics highlight the urgent need for improved safety measures in the industry, making it a critical area of concern for policymakers, industry leaders, and researchers alike.

Researchers worldwide have dedicated significant effort to identifying the root causes of workplace accidents. Human errors and unsafe behavior are the main culprits, accounting for almost 90% of all accidents (Li et al., 2021; Bussier & Chong, 2022). In recent years, researchers have identified some factors that can exert a positive or negative effect on the safety performance of construction workers. These include fatigue, safety attitude, superstitious beliefs, safety climate, and demographic characteristics such as age, gender, training, experience, job role, and education (Ibrahim et al. 2021; Kashmiri et al. 2020; Namian et al. 2020; Pandit et al. 2019; Taherpour et al. 2020).

Past research has demonstrated that up to 50% of hazards were unrecognized (Pandit et al. 2019). Several emerging technologies have been developed to help workers identify potential hazards, improve collaboration among people involved in the construction process, and document construction accidents to prevent tragic accidents. Building Information Modeling (BIM), one of many emerging technological solutions assisting construction activities, has gained significant traction as a way to improve hazard recognition. Research has indicated the most effective way to improve safety on construction projects is to design safely from the beginning of the project so that future hazards can be eliminated (Akram et al. 2022). Moreover, to enhance management's decision-making processes, machine learning (ML) has garnered attention for its ability to analyze vast quantities of data and identify potential construction site hazards. Unlike traditional techniques, ML can efficiently handle large datasets and utilize various algorithms to quickly analyze and produce more accurate interpretations (Taherpour et al. 2024).

In addition to technology and human errors, refining safety processes within construction projects is critical. Effective safety management processes involve systematic hazard identification, risk assessment, and the implementation of control measures throughout the construction lifecycle. Adopting standardized safety procedures, regular safety audits, and continuous monitoring can greatly reduce accidents. Moreover, integrating a safety management system (SMS) that aligns with international standards such as ISO 45001 can help establish a proactive safety culture. Process improvements should also focus on enhancing communication and coordination among all stakeholders as well as ensuring that safety protocols are consistently followed and updated as needed. By fostering a culture of continuous improvement and learning from past incidents, construction firms can develop more resilient and safer work environments (Choudhry et al. 2007; Cooper 2000; Gibb et al. 2006; Lingard and Rowlinson 2004; Šolc et al. 2022).

Near-miss information is considered important information for preventing accidents since workers are exposed to numerous accidents every day without being injured. Near-miss experiences can improve their safety skills (C. Zhou

et al., 2019). Near-miss events occur more frequently in the construction industry than serious incidents and, under marginally different conditions, could potentially lead to damage, injuries, or fatalities (Cambraia et al. 2010). Some events are not as evident as others, yet all should be considered significant as they accompany health risks. Near-miss reporting can serve as a useful tool for managing safety as it allows workers to identify and managers to address potential risk factors on project sites. Compared to the lagging indicator of reported injuries, near-miss data can serve as a leading indicator of how to fix problems before injuries or fatalities occur (Aulin and Linderbäck 2014). Reporting and investigating injuries may provide a more detailed picture of events and alert organizations to a failure in an area of their safety and health programs or to the existence of a hazard. Near-misses can also inform organizations about whether their safety and health programs are effective at preventing incidents.

The Kentucky Transportation Cabinet (KYTC) has recently emphasized the importance of near-miss reporting, transitioning from a paper-based system to a web-based reporting tool. A previous project — KYSPR 22-615 — on near-miss reporting found several issues with the web-based tool, such as prolonged turnaround times because reports need to be manually handed off to multiple individuals before reaching the appropriate desk. Additionally, paper forms are often mislaid, resulting in a lack of corrective actions.

Recognizing these shortcomings, KYTC saw the potential benefits of digitalization. By adopting online reporting, the agency sought to save time and money, as digital platforms store information instantly and allow for timely analysis. This shift lets KYTC implement corrective actions across the state, supported by statistical data. Seeing the advantages of having a centralized database for safety information analysis, KYTC decided to invest in a SMS. With assistance from the Kentucky Transportation Center's (KTC) Occupational Safety and Health Program, KYTC chose Origami Risk — a cloud-based SMS that offers a wide range of customizable risk management, environmental health, safety, and data analytics tools accessible via web browser and mobile app — for its new, comprehensive SMS.

1.2 Problem Statement

SMSs let departments of transportation (DOTs) electronically report, manage, control, and audit issues related to employee safety. They allow safety and health divisions in DOTs to become more agile, effective, and knowledgeable about employee safety. Recently, KYTC worked with a third-party provider to purchase a significant and holistic SMS software that has the potential to revolutionize data collection, control, and management safety throughout the Cabinet. However, such a large and significant system needs documented procedures, processes, and plans for effective deployment. Without these, benefits will not be maximized. This research project documented procedures for the SMS use, developed plans for agencywide rollout, and assisted the Secretary's Office of Safety with evaluating the SMS.

1.3 Objectives

The KYTC Secretary's Office of Safety needed a better option to electronically report, manage, control, and track safety practices at KYTC. This effort assisted in identifying an appropriate SMS and provided support to maximize the success of implementation. The project had the following objectives:

- Assist in marketing and value proposition to maximize the success of the SMS rollout
- Analyze data for additional insights and safety improvements
- Evaluate KYTC personnel perceptions of the SMS

Chapter 2 Literature Review

2.1 Safety Management System Used by DOTs for Employee Safety

A review of internationally recognized academic search engines found limited published work on the use of SMSs for DOT employee safety. The most significant study that used a SMS for worker safety in the highway construction and maintenance sector was conducted by Dadi et al. (2022). It involved an online survey questionnaire that was sent out by email to members of the American Association of State Highway and Transportation Officials Committee on Construction (AASHTO COM) and the North American Association of Transportation Safety & Health Officials, Inc. (NAATSHO). It was used to better understand the current use of SMS in DOTs (Dadi et al., 2022). There were 41 fully completed responses from 41 state DOTs. Out of the 41 responses, 27 DOTs have or have had an SMS, and 14 DOTs did not have any SMS experience. Nine DOTs did not reply. When asked what information was collected, 100% of the DOTs collected data on incident occurrence, 65% on incident investigations, 42% on near misses, 39% on training records, 23% on Toolbox Tasks/Pre-Job Briefings, 23% training guides, 23% policy manuals, 23% other write-in data, and 19% on behavior observations.

Regardless of whether it was an system developed in-house, a commercial system, or no system at all, most of the data entry was through a web-based portal (70%), 41% collected data on paper and manually entered it into an electronic system, 30% entered data through an Excel spreadsheet or similar software, 30% collected data through a scanned in paper converted to a PDF, 19% entered data through a mobile application, and 11% collected data on paper (Dadi et al., 2022).

Once data are collected, information can be distributed to multiple people to keep for their records, to self-address, to provide corrective actions, or to not be used for any action. Using the data from the SMS overall helped improve documentation efforts, improve health and safety business efficiencies, improve health and safety performance while reducing associated costs, and improve organizational relationships (Dadi et al., 2022). Common aspects noted by DOTs that were needed for SMS implementation were written policies and procedures, which help guide data entry and reporting and assign responsibility to individuals to manage and interpret data. Another aspect is close organizational relationships, specifically leadership commitment to safety, which motivated field crews. The decision to make occupational safety a separate division and not grouped with human resources or another department was noted as important by DOTs.

Cybersecurity was a concern for any web-based system as well as system accessibility of the system (via intranet or internet, for field crews). Another challenge DOTs faced was changing the workflow of how safety was managed. It had pushback due to the lack of confidence in the new system due to the possibility of data inaccuracies. After the data were processed came another challenge of needing more administrative efforts for data entry and reviewing analyzed data to better understand safety trends. The cost was only noted as a challenge by DOT that did not have a SMS. The 41 DOTs that responded knew it was a significant investment but did not see cost as a challenge (Dadi et al., 2022), especially when deciding to develop an in-house system or to purchase a commercial system that fits their needs.

Of the 41 DOTs that responded, five were selected for in-depth analysis. The five DOTs were asked to participate in web interviews to collect more information on their SMS processes and strategies. These agencies were chosen because of their survey responses. The survey responses describe their experiences with SMSs that could be a guide for other DOTs. The five DOTs chosen for case studies were Connecticut, Nevada, Tennessee, Texas, and Virginia.

Staff from each agency were asked seven questions (Dadi et al., 2022):

- Describe the decision-making process (how? when? and why?) to acquire/develop a safety management system (SMS).
- Describe your agency's organizational structure to manage maintenance worker safety (i.e., what division is responsible, what staffing resources exist, what responsibilities exist).
- How is your SMS deployed, used, and managed?
- Describe the SMS's features, functionality, benefits, and mechanisms used.
- What policies and procedures do you have pertaining to the SMS? Are they in official policy manuals?
- What would you estimate as the costs associated with acquiring, maintaining, and managing your SMS (rough estimates are sufficient)?
- What suggestions do you have as lessons learned or best practices related to the use and implementation of safety management systems?

Experiences varied among agencies. The Connecticut DOT decided to use a SMS to improve its worker safety data and to get better analysis from the information. This required the Connecticut DOT to decide to switch to a new digital SMS from its previous paper-based SMS. The problem with the paper-based SMS was the statistical analysis of data was general and could not give in-depth information on the areas of concern. The digital SMS is a cloud-based commercial safety database system.

The SMS was customizable and could be configured to the DOT's needs. The system has many features like collecting safety data, accidents, injury management, and medical monitoring. The system can analyze data to track trends and give statistical insight. The other features offered by the SMS are occupational health and safety like training and industry hygiene for the DOT employees. A challenge of the SMS is access. Some features of the SMS are only accessible through the intranet. This restricts the employees' abilities, which is why Connecticut DOT is looking for a solution. A benefits analysis has not been conducted by the agency, but it has found the new perspectives on safety data valuable. The DOT can make better-informed decisions to help workers, but no analysis has been done to quantify the return on investment or reduce injury rates/worker compensation. In hindsight, the Connecticut DOT would put more effort and resources into figuring out the how-to and how-long details of SMS implementation (Dadi et al., 2022). This was gradually done due to limited resources. The importance of getting everyone to support the system required the DOT to train the crew, managers, supervisors, and superintendents.

The Nevada DOT SMS was developed in-house and was influenced by OSHA programs. The main intention was to build a stronger safety culture. The Nevada DOT has a predefined workflow that happens when an incident occurs using its SMS. When an incident occurs, the employee is trained to inform their supervisor and to complete a report with all the details. Once that report is uploaded an investigation starts that involves a meeting with district safety officers or district engineers to address the issues. The SMS modules that can monitor crash investigations, worker compensation claims, training, and trends. System benefits can be seen by comparing 2011 and 2020 injury data. In 2011, there were 145 reported injuries, but in 2020 there were only 55 reported injuries (Dadi et al., 2022). In 2019, there were 75 reported injuries. It can be assumed that COVID-19 affected the 2020 data. Another benefit was the reduced cost per claim in worker compensation. The cost per claim in 2011 was $18,000 and was reduced to $7,800 (pre-COVID-19). Overall, the Nevada DOT has seen a savings of $300,000 per quarter in worker compensation claims because of its SMS.

When asked about SMS implementation suggestions and lessons learned the Nevada DOT staff used this to reflect on how their efforts have been successful by keeping the system in-house with in-house training. They have been

able to avoid the cost of third-party providers and can have a hands-on approach to what is being done in the SMS. They also remarked on the importance of having leadership support to roll out the system successfully.

The Tennessee DOT's decision to use a SMS was due to several traumatic events. In 2016, the DOT experienced three fatalities, which was the moment Tennessee DOT knew it needed to create a stronger safety culture and a safer work environment. The agency established safety director and assistant director positions to review written programs and safety data. In 2017, they began reaching out to other DOTs and talking with field crews to get their opinion on what was needed in a SMS. After gathering the information, Tennessee DOT developed an in-house SMS. It started from paper property damage and injury reports and worker compensation data from a third-party administrator. It was shared through Microsoft SharePoint to make reporting easier.

The transition to a digital system changed how Tennessee DOT communicated and improved decision making related to safety. Also, having a full-time data analyst helped uncover safety trends. The SharePoint allows the agency to effectively communicate information to employees in every county. An example described is "Safety Mondays," where the crews are shown a safety-related video in all 95 county maintenance shops or construction offices. The Tennessee DOT SMS is a Tableau Software. Some features of the software included a dashboard tool that can provide a visual report of the data and trend analysis. Another benefit was the SMS reduced estimated worker compensation and property damage costs by approximately $1 million in 2019 (Dadi et al., 2022).

In hindsight, the Tennessee DOT realized that a SMS was needed, but the culture around safety played a huge part in its success. Establishing a strong safety culture through an internal campaign called *Work 4 Us* helped gain the commitment of the crew members to work safer. Building trust among leadership, management, and crew members is a key component of safety.

The Texas DOT's SMS was originally a system used for collecting basic information on worker compensation and vehicle accident claims. The system evolved into a Microsoft Access database that could store the data and track claims. The big push to have a fully function SMS came after the agency adopted the Safety Mission Zero approach of having no employee fatalities. Texas DOT realized it needed a more comprehensive digital SMS to reach this goal. Texas DOT's SMS is a commercial safety system that was customized to fit its needs. The system is combined with Tableau software to create a dashboard for viewing. The SMS manages and tracks injury and incident reports, claims, vehicle incidents, and employee safety and health. It is accessed through Texas DOT's intranet and has access to the Texas DOT's personnel database. The benefit of the SMS and Texas DOT's personnel database being integrated is it saves time and reduces input errors when creating reports (Dadi et al., 2022). Error-free reports are a priority because of Texas DOT–controlled workflows. Every report is sent to multiple people to either investigate, develop a solution, or decide on compensation. Before the investigation can be closed, the incident report must be reviewed to determine the root cause and ensure a corrective action is assigned.

Some benefits of Texas DOT SMS are the attention to detail and customization, which allows the agency to add and create modules to fit their needs. A new module can be offered to other DOTs that are looking at acquiring a SMS or want to add new features to their current system. Another benefit is reduced fatalities.

Texas DOT has an average of one employee fatality per year but in the past three years, there has been zero employee fatalities. Looking back, the Texas DOT understood the severity of adopting such a comprehensive system. The DOT knew it was an investment that required many informed decisions. They determined their needs and made sure to shop around for a system that offered everything they needed and could be customized to fit their current and future plans.

The Virginia DOT leadership in the safety division decided to develop a SMS to better understand their safety data. Before this, the agency collected paper reports, before shifting to a Microsoft Excel spreadsheet. Reports are reviewed by the district safety manager and are passed to the assistant director in the central office safety division for additional review. Virginia DOT worker compensation is run by a third-party provider. By connecting their SharePoint system, they can provide an automatic paperless process. The agency's SMS is a Microsoft SharePoint Platform with a predefined workflow that collects data through Microsoft InfoPath Forms. This is done for vehicular and equipment crashes or incidents, incident investigations, occupational health, civility training, and programs in the workplace. Another example of this is the Integrated Solutions program, which allows the purchase of PPE, chemicals, and oil with the approval of the safety division (Dadi et al., 2022).

For training purposes, Virginia DOT uses a learning management system called Virginia DOT University. The training on the learning management system is created by the agency, but plans are in place to create classes for equipment certifications. The agency's safety division also plans to use a geographic information system for near-miss reporting and data collection. All these individual systems collaborate to create monthly or quarterly safety report analyses to see if safety is improving or worsening. Virginia DOT did not quantity benefits the benefits of its SMS, however, the system is viewed as providing an opportunity for the agency to grow and have a stronger safety culture and safer work environment.

2.2 Safety Management Systems Used in Other Industries

The Center for Aviation Safety Research at Parks College of Engineering, Aviation and Technology, Saint Louis University created a study showing the benefits of SMS implementation and the costs of developing a SMS program as well as costs associated with incidents and accidents. They used a macro-to-micro level of analysis to demonstrate the benefits of safety programs. The macro level of the study involved three major air carrier accidents that all resulted in damage to airplanes and the loss of life in two of them. The macro-level analysis of the accidents showed that the parent companies involved stock prices dropped when measured one, three, six, and twelve months after the accident, showing a correlation between accidents and stock losses (Lercel et al., 2011).

McCarthy Building Companies, Inc. is the 10th largest general contractor in the United States with $3.5 billion in annual revenue. They established a safety system in 1997 that had broader safety culture concepts and system management policies and procedures (Lercel et al., 2011). The firm invested $2.3 million which covered the cost of the software and hardware for the new system. The results showed that in twelve years there was a 92% decrease in lost time and recordable incident rates. Workers compensation insurance losses fell from $3 million in 1997 to approximately $240,000 in 2009 (Evan et al., 2010).

Ultimately, the relevant literature indicates that installing a SMS is a significant organizational change. In assisting KYTC with an effective rollout, some change management principles were used ahead of the rollout as described in Chapter 3. Further, the success of the rollout depends on appropriate knowledge, skills, and abilities of the workforce to effectively utilize the system. Methods to assess and evaluate that component are also detailed in Chapter 3.

Chapter 3 Methodology

3.1 Phase I: Organizational Planning

3.1.1 DECA Readiness Assessment Plan

After the kickoff meeting with the Kentucky Transportation Cabinet (KYTC), the research team had a better scope of the project and what concerns the agency had with the new SMS. The SMS that was purchased is Origami Risk, but it was renamed BOOTS (Boosting Occupational Outcomes in Transportation Safety) for KYTC's use. The research team first created a BOOTS readiness assessment plan with information provided from web interviews with the KYTC Secretary's Office of Safety and from KYTC presentations given at the 2021 and 2022 NAATSHO Conference. The purpose of the readiness assessment plan was to provide a breakdown of the research team's vision moving forward with BOOTS implementation.

The research team wanted to provide KYTC with a clear and concise plan. The readiness assessment plan contained four sections: Define, Establish, Communicate, and Answer (DECA). The Define section (Figure 3.1) represents the "define the solution" objective of the readiness assessment plan. This section had basic information like who, what, where, why, and when of the BOOTS implementation. This required research on what was possible with the Origami Risk system. The first step was to figure out how customizable the system was and how data from the system could be analyzed. The Establish section (Figure 3.2) was used to "Establish KPIs or Key Performance Indicators." The research team developed a list of leading and lagging indicators for crews, superintendents, district safety coordinators, and KYTC State Highway Engineers (SHEs). The Establish section also introduced the plan of conducting a focus group session. The Communicate section (Figure 3.3) was the strategy for "how to" effectively share BOOTS implementation with the employees of KYTC. The last section of the readiness assessment plan is Answer. The Answer section (Figure 3.4) severed a reminder to provide a space for feedback and questions. This was meant to be used for the BOOTS focus group sessions that would later be held.

Define the Solution

Origami Risk

- **Why…**
  - Improving the safety culture across KYTC
  - Become a "Performance-based, data-driven" organization
  - Tie lagging & leading indicators together
  - Move from paper-centric to data-centric
  - Automate data collection & integration
  - Support digital transformation vision of KYTC
- **What…**
  - Web-based Safety Management System through Origami Risk
    - Incident Reporting, Notification, Workflow, Investigation, and Follow through
    - Job and Process/Equipment Management on Jobsites
    - Employee Hazard Exposure Management Tools and Assessment
    - Interconnect across all functions for reporting, analysis, workflow, & consistency
- **Where…**
  - Throughout the crews, districts, and executive levels of the Kentucky Transportation Cabinet
- **When…**

Task Name	Start Date	End Date
KYTC Origami Implementation	06/09/22	07/10/23
KYTC Project Launch	06/09/22	07/07/22
Setup Origami Database	06/21/22	06/23/22
Configure Users / Security / SSO	06/22/22	04/14/23
Convert Historical Data	06/22/22	02/02/23
Convert Risk Master Data for Ongoing Processing	06/13/22	02/17/23
Risk Sytem Configuration	06/22/22	05/12/23
EHS System Configuration	11/07/22	04/21/23
Configure Interfaces	09/26/22	04/21/23
Configure Reports & Dashboards	04/03/22	05/01/23
Prepare for Go Live	02/14/23	06/22/23
Go Live	07/10/23	07/10/23
Post GO LIVE Punchlist	07/10/23	07/24/23

- **Who…**
  - *Is leading*
    - Secretary's Office Of Safety (Tony Courtwright)
    - SMS Champion (Jon Lam)
  - *Benefits or is impacted*
    - Secretary's Office Of Safety (Tony Courtwright)
    - SMS Champion (Jon Lam)
    - Area Administrators
    - District Safety Coordinators
    - Maintenance Superintendents and Crews

Figure 3.1 Define Section in Readiness Assessment Plan

Establish KPIs

Identify a list of KPIs (metrics) and connect KPIs to different stakeholders

Conduct a focus group session with Crews, Superintendents, and District Safety Coordinator in one district per administrator responsibility to review and identify KPIs and particular concerns. In addition, conduct a focus group session with representatives from the State Highway Engineers (SHE) Office of KYTC. In the tables below, some conceptual ideas for KPIs are presented for each stakeholder group. The focus groups will add, refine, and delete KPIs as they see fit.

Crews

Leading Indicators	Lagging Indicators
Time for data entry	Time for request follow-up
Number of access times	More frequent JRAs
Confidence in confidentiality	

Superintendents

Leading Indicators	Lagging Indicators
Time for data entry	Time for request follow-up
Number of access times	More frequent JRAs
Confidence in confidentiality	

District Safety Coordinators

Leading Indicators	Lagging Indicators
Time for data entry	Incident response time
Number of access times Number of paper forms/submissions received	More frequent PPE inspection More frequent jobsite and facility observations Percent of suggestions with follow-up actions

KYTC SHE Office

Leading Indicators	Lagging Indicators
Safety more frequently discussed	Incident response time
Employee willingness to report Worker's Compensation amounts Number of paper forms/submissions received	Better OSHA annual reporting and analysis Percent of suggestions with follow-up actions OSHA statistics

Figure 3.2 Establish Section in Readiness Assessment Plan

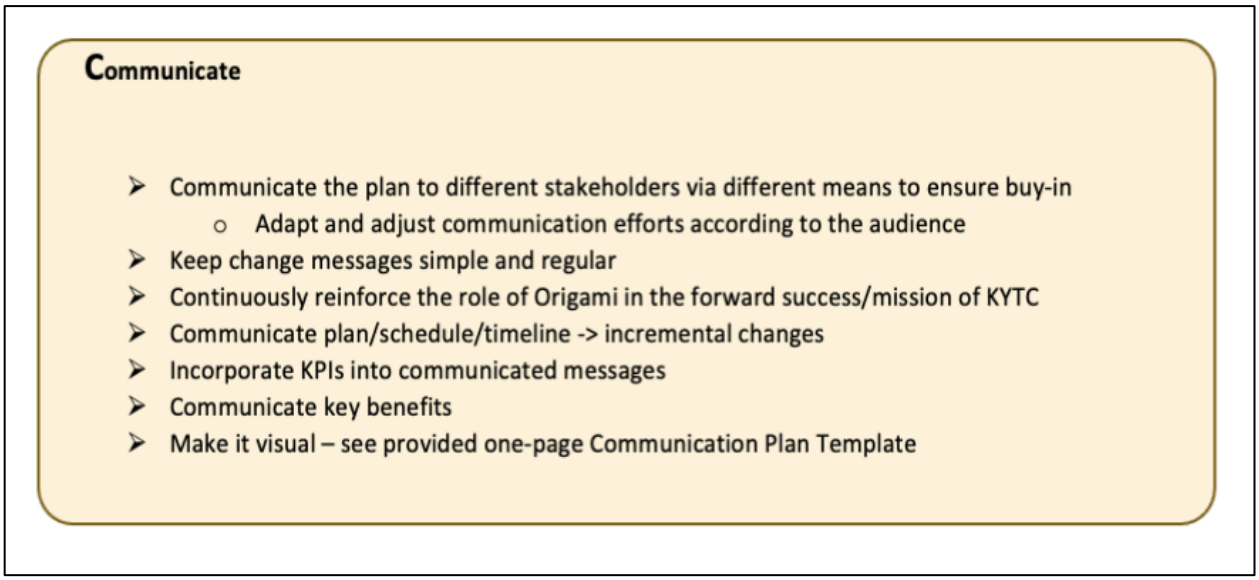


Figure 3.3 Communicate Section in Readiness Assessment Plan

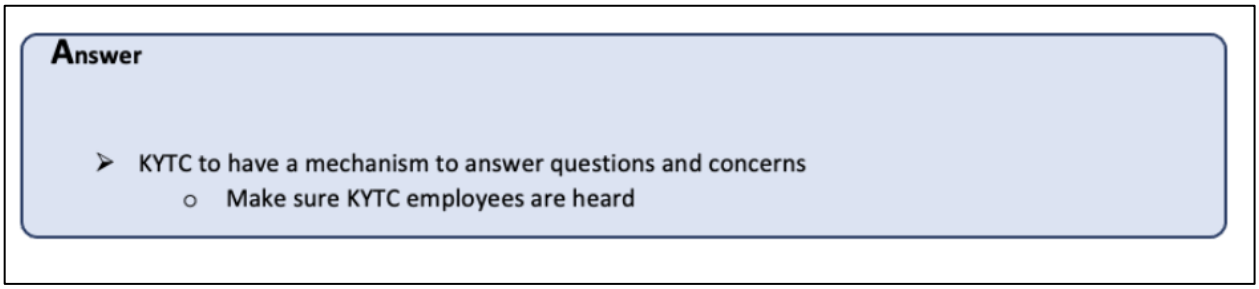


Figure 3.4 Answer Section in Readiness Assessment Plan

3.2 Phase II: Implementation Planning

3.2.1 Focus Groups

A series of focus groups where then planned to inform districts of the upcoming SMS rollout and collect feedback on what they were interested in and what roadblocks they envisioned. When deciding what district to conduct the focus groups in, the research team sought assistance from the KYTC Secretary's Office of Safety. KYTC after deliberating decided to conduct focus groups in District 05 and District 12. District 05 covers an eight-county area, including Bullitt, Franklin, Henry, Jefferson, Oldham, Shelby, Spencer, and Trimble counties. The focus group met in Louisville. District 12 covers a seven-county area, including Floyd, Johnson, Knott, Lawrence, Letcher, Martin, and Pike counties. The second focus group met in Pikeville. These districts were chosen because KYTC wanted to get feedback from a range of employees. These two districts have unique safety hazards due to their population and location. This would let KYTC hear from staff working in more populated urban and less dense rural environments. Something that was also considered is these districts were perceived as having either a more active or less active safety program than other districts. The focus groups met in the district maintenance barns. Focus groups were going to be for an hour. The number of attendees was ideally no more than 15 people —7-10 maintenance crew, 2-3 superintendents, 1-2 transportation engineer supervisors, 1 safety coordinator, and 1 Chief District Engineer. The agenda for the focus groups is printed below:

- Introductions (5 minutes)

- Microsoft PowerPoint: Introduction of the SMS (15 minutes)
- Questions (5 minutes)
- Feedback on anticipated use (20 minutes)
- Feedback on branding (10 minutes)
- Closing and timeline (5 minutes)

From the DECA assessment plan, the research team knew how to effectively communicate information about BOOTS in a short amount of time and decided on a Microsoft PowerPoint presentation. The presentation went through multiple revisions to ensure it targeted the correct audience without communicating too much information or too much behind-the-scenes information that could overwhelm them. The presentation can be found in Appendix A. An outline of the Microsoft PowerPoint presentation follows:

- Introduction of SMS
- Our Solution
- What can it do?
- Project Phases and Elements
    - Focus Area 1: Incident Reporting and Response
    - Focus Area 2: Process Management
    - Focus Area 3: Hazard Exposure Management
- Foundation of System
- "How to" Access the System
- Incident and Near-Miss Reporting Process
- Individual Capabilities in SMS
- Specific Data Type Access per User
- Questions
- Feedback & Timeline

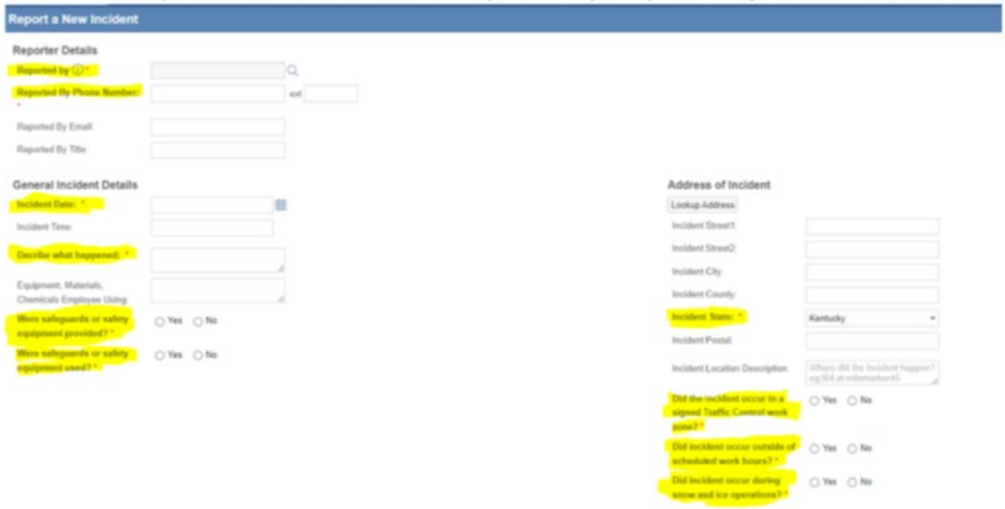
The presentation introduced problems shared across KYTC followed by the introduction of the new SMS and its key features. The project was divided into three phases and elements. For the system's foundation, a visual was shown of what happens to data are input into the BOOTS (Origami Risk Database). Instructions for accessing the SMS were also provided, with directions given for accessing it from a desktop or a mobile device. Another visual used showed the pre-defined workflow for reporting an incident or near-miss. The next Microsoft PowerPoint slides are tables with information showing what each user can do or see in the system. At the end of the presentation feedback was collected on ways to motivate users and any suggestions for branding. Feedback and questions collected were sent to KYTC for review.

3.2.2 BOOTS Training

The next step was to assist with training. KYTC collaborated with a team from Origami Risk to learn how to use the system and to create a user-friendly dashboard. The KYTC Secretary's Office of Safety then created a user manual with screenshots of the BOOTS reporting system to give step-by-step directions. In addition to the manual, narrated videos were created to guide users through different modules and sections. The research team assisted by reviewing the videos and providing feedback on the quality, duration, and step-by-step instructions. The objective was to make sure the videos were clear enough for employees with little to no computer knowledge to follow along. The research team also wanted to ensure the videos were concise enough that if a crew member needed help in the field, the

video could assist the crew in real-time. KYTC planned to introduce a new module with a new training video every few weeks to give everyone time to get acclimated to the new SMS.

4. Fill out all forms with all of the information that is available. The fields denotated with red asterisks are required to complete report.
    a. For all Incident addresses please enter a specific address if available, however, if not use the incident description to provide a street name, intersection, mile marker, or use the lookup address button. **For the reported by only fill out your first and last name**.



5. Next you will select which type of incident occurred, Employee injury, state property damage, private property damage, or non-KYTC employee injury:

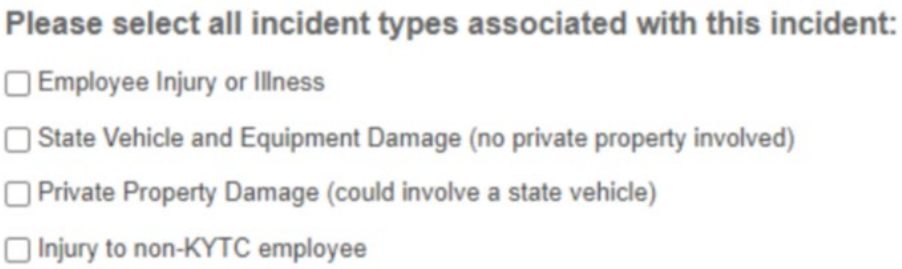


Figure 3.5 Snippet from BOOTS User Manual

User Training Resource Contents

Topic #	Subject
0	RMIS 1.1 / 1.2 - Incident & Safety Opportunity Reporting, Notifications
1	RMIS 2.1/2.2 Workers Comp Admin & RMSC Data
2	RMIS 1.3/1.4 - Supervisor & Safety Investigation
3	EHS 1.1 - Safety Observations/Audits
4	RMIS 2.3 Property Damage Admin
5	RMIS 1.5 - Root Cause Analysis
6	EHS 1.2 - Asset Tools & CertificationTracking
7	EHS 2.1/2.2 - JHA & SDS Access, Job Safety Briefings
8	EHS 2.3 - Work Permits process
9	EHS 3 Medical, exposure records, etc. (LATER)

Figure 3.6 Narrated Training Video Topics

After going live and a few weeks of collecting data. Another web meeting was scheduled for a recap and to review progress. KYTC informed the team of their trial and error with customizing the dashboard to show data that could be beneficial to them. The research team was asked to assist with data analysis. The challenge KYTC had to figure out was how to interpret data to assist in corrective action decisions. The first round of data analysis required the research team to find the easiest way to export data from BOOTS software. The best solution for data capture and analysis was Microsoft Excel.

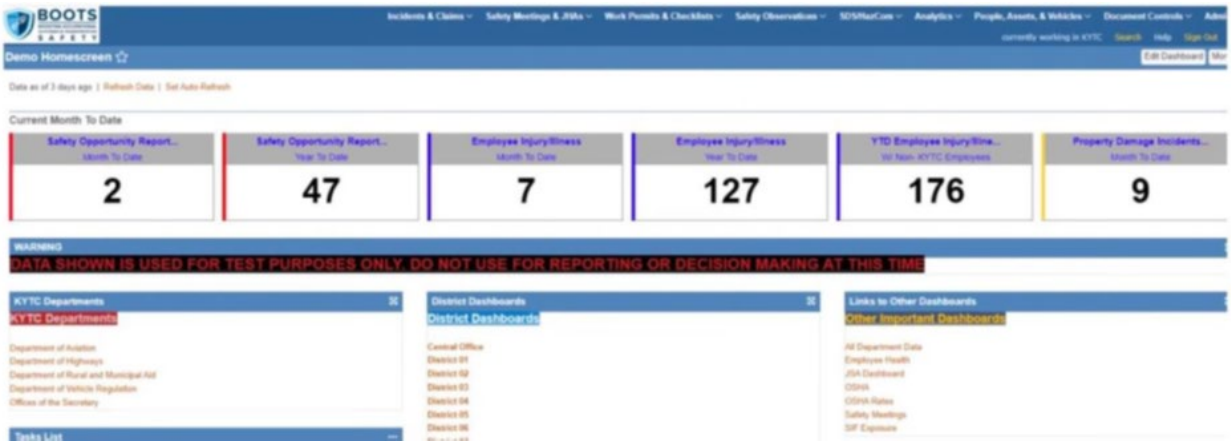


Figure 3.7 BOOTS Training Dashboard

3.3 Phase III: Assessment

3.3.1 Evaluation of the BOOTS System

To assess the BOOTS system, the research team distributed an online survey to KYTC staff. (Table 3.1). By employing an online format, the survey gave employees the flexibility to participate at their convenience, thereby enhancing the likelihood of thoughtful, detailed responses.

The survey was organized into various segments, each designed to assess specific components of the BOOTS system. The initial segment collects positional information from respondents, such as job titles and the districts and counties where they are employed. The next sections were designed to examine participant experiences with the software. They ask about the duration of their use of BOOTS, their perceptions of its user friendliness, and the frequency of their interactions with it. Collecting these data was important to develop key insights into how the software can be used and the extent to which it has been integrated into the organization's routine operations.

Software implementation required training and support. One part of the survey was designed to explore these aspects by asking participants about the quality of training they received, the availability of support resources, and the responsiveness of the support system. The functionality portion of the survey let participants share insights on the features and tools within BOOTS they consider either useful or challenging. This feedback can inform future improvements and adjustments to the software, ensuring that it continues to meet user needs and expectations. One section of the survey captured the concerns of participants, their hesitations, and their suggestions for making the system better.

Lastly, demographic information adds context to responses by considering factors such as experience, education, and age. These data helped the research team understand how multiple demographic groups interact with the software and the benefits derived from it.

Table 3.1 Survey Structure for Assessing BOOTS System Usage

This questionnaire has been developed to measure employees' perception and satisfaction levels with the safety management system entitled BOOTS, or Boosting Occupational Outcomes in Transportation Safety, to facilitate future improvements. We appreciate your time and participation in completing this questionnaire.	
1-Position Information "The information is confidential and will be utilized exclusively for enhancing BOOTS. Your information or any of your individual responses will not be provided to anyone at KYTC. Maintaining confidentiality is a crucial aspect of this study."	
Number	**1 — Job Information**
1.1	What is your position title at KYTC?
1.2	Which district do you work in?
1.3	Which county do you work in?
	2 — BOOTS General Use
2.1	How long have you been using the safety management system called Boosting Occupational Outcomes in Transportation Safety (BOOTS)?
2.2	On a scale of 1 to 5, with 1 being the lowest and 5 the highest, please rate the overall user-friendliness of the software.
2.3	How frequently do you use the software in your daily work or tasks?
	3 — BOOTS Training
3.1	Did you receive training in using or accessing BOOTS?
3.2	(If yes to Q3.1) Do you believe the training you received on BOOTS was adequate?

3.3	Does KYTC provide you with the needed resources should you have any issues with BOOTS?
3.4	(If yes to Q3.3) Please indicate what type of resources are provided and rate their usefulness on a scale from 1 to 5:
	4 —BOOTS Functionality
4.1	What specific features of the software have been most useful in improving safety in your daily KYTC tasks?
4.2	Are there any features or functions that you found difficult to use or that you believe could be improved?
	5 — BOOTS Challenges and Concerns
5.1	What, if any, technical issues have you encountered while using the software? Select all that apply.
5.2	What, if any, concerns, or reservations do you have about the privacy and security of the data you input into the software?
5.3	How responsive has the support or help desk been in addressing your concerns or issues with the software?
	6 — BOOTS Perception
6.1	Do you feel that using the software has improved safety measures with your KYTC-related activities?
6.2	How has the software improved or not improved safety measures with your KYTC-related activities?
6.3	Would you recommend this software for other state transportation agencies for safety information collection?
6.4	Has the software made your work tasks more efficient and streamlined?
6.5	Overall, how would you rate the software's contribution to enhancing safety KYTC?
6.6	Please share any additional comments, suggestions, or concerns about the software not covered by the previous questions.
	7 — Demographic Questions
7.1	How many years' experiences do you have with KYTC?
7.2	What is the highest level of school you have completed or the highest degree you have received?
7.3	How old are you?

3.3.2 Content/Thematic Analysis

Content analysis is useful for evaluating large amounts of unanalyzed textual data (e.g., interview transcripts, open-ended survey responses, written documents). It can explore data to identify related ideas or concepts and organize them into pertinent themes that capture the meaning of responses expressed by participants (Johnson et al 2020). The research team chose content/thematic analysis to accomplish several goals:

1. Understand employee perceptions: Analysis of the open-ended responses from the survey enabled the research team to grasp how employees understand and interact with the BOOTS system.
2. Identify areas for improvement: By analyzing the data, the research team uncovered themes related to problems, concerns, or areas where the BOOTS system could be improved.

3. Develop suggestions and recommendations: The BOOTS system can be enhanced when employees give their opinion about it. Therefore, content/theme analysis let the research team identify and organize opinions into actionable themes.
4. Evaluate contextual factors: Analysis can illuminate how contextual factors like job roles, previous experience influence employees' perception and attitudes towards the BOOTS system.

Content/theme analysis is a useful approach in qualitative research because it lets researchers gain in-depth insight, identify patterns or meanings, and develop rich understandings from text data. This, together with quantitative data, painted a comprehensive picture of how employees viewed the BOOTS system, which can be used to guide future improvement and decision making.

Chapter 4 Results

4.1 Focus Group Concerns

Questions posed to focus groups fell into three categories: connectivity, training, and logistics. The concerns involving connectivity were about internet service in the field, especially in more rural areas. Another concern mentioned was the maintenance barns are known to have weak Wi-Fi strength. The questions asked were "What tasks can be done offline?" and "What tasks need a connection to be done?" This led to concerns about SMS access. There was some pushback on the use of personal devices since field crews are not given work devices or cell phones. It was also brought up that each maintenance barn is provided with one iPad. This makes it difficult for multiple task-based job briefings and equipment inspections to be done at the same time. The suggestion from the focus group was to have more iPads provided with cellular data that would have the SMS link or QR code readily available for the crews. Concerns over connectivity also stimulated questions about whether it is okay to share the responsibility of reporting with someone who has a good internet connection if the employee in the field is not able to. This continued into the logistics concerns.

Logistical questions related to how reporting would work in the system. The first few questions were "Can a report be started by an individual and then assigned to another to complete?," "Can one be started, saved, and finished later by the same individual who is not a licensed user?," and "Can reports be modified to add information as new info comes in (i.e., police reports)?" Focus groups wanted to know where the notifications would come from and what would they be about. They wanted to know if there would be notifications that serve as reminders for training, PPE, safety checks, vehicle maintenance, equipment inspections or maintenance, and job briefings. Another concern related to logistics was verifying signatures to confirm and verify the participants in a job briefing.

The other concerns from the focus group were questions and comments on the training aspect of the SMS rollout. The focus group wanted to know what kind of training would be provided due to the learning curve for using a digital SMS. The focus group also communicated that they "would benefit from hands-on training and the ability to submit dummy reports to build confidence in reporting." To build their confidence with the new system they also said they would like a checklist to know what information is needed to create a report and alert them if any information is missing.

Minutes from the focus group can be found in Appendix B. The feedback from the focus group gave the KYTC Secretary's Office of Safety an idea of how employees felt about the new SMS. It allows them to plan their rollout to address staff needs and concerns. Internet service is an important aspect to the successful implementation of the SMS. This is something that can be worked on with the internet service provider. The initial pushback against using personal devices is understandable. However, due to limited resources, a solution has not yet been developed, but executive leadership is aware of the challenge. Concerns about internet service and devices show the desire to work together and to use this system. These are productive thoughts by the crew to ensure minimal issues with the SMS on their end. Once the crew has more experience using the SMS, this concern can be revisited to determine if more devices would improve the use and accuracy of the data in the SMS.

The logistics concerns are important, but the crew cannot edit or modify the report once submitted. The BOOTS software has a limited number of licensed users. Licensed users can edit and modify reports. Any information that is not initially collected by the crew can be added, but only by administration. In the beginning, this could require more collaboration from administration on editing reports. However, KYTC has hired a resource management analyst to oversee the SMS who could share some of the responsibility. These logistics concerns can also be better resolved in phase two of the project, once more accurate data are available. In phase two of the SMS project, the focus will

be on rolling out process management. The concern about verifying signatures for attendance can also be addressed when the focus shifts to job safety briefings and vehicle/equipment inspections in phase two. The question of notifications serving as reminders for training, PPE, safety checks, vehicle maintenance, equipment inspections or maintenance, and job briefings can also be addressed when the module is revealed. The software can be customized to meet KYTC's needs.

Based on the feedback gathered from focus groups, the KYTC Secretary's Office of Safety saw a need for visual training. The visual training came in two forms. A user manual was created with step-by-step instructions to show employees what information was needed in a report. The SMS also has required questions that are marked with an asterisk to alert employees of information missing from the report. To help with training, the KYTC Secretary's Office of Safety created narrated videos to give employees guidance on the new system. The research team was asked to view the videos and provide feedback. Overall, the videos were very informative, but it was suggested the videos be broken up into shorter individual topics. It was also mentioned that there is a need for an assessment after every video to ensure that each employee has viewed the training videos and understands the topic. The research team also expressed concerns about how the video is filmed mirroring a desktop view and on a mobile device it could look different. For example, the dropdown lists with options for causes and injury codes were very long and could be hard to read on a mobile device, potentially resulting in errors.

4.2 BOOTS Results

Once BOOTS went live and data started coming in, KYTC reached out to the University of Kentucky Civil Engineering Department to assist with basic data analysis. During the first couple of months of operation, KYTC inserted previous incident claims, safety opportunity reports, and worker compensation claims. The research team used the go-live date of July 10, 2023, as a marker to compare the previous process to the new process with the safety management system. The idea was to show the effect the new SMS had on KYTC employees thus far. To show the effect on claims, September 2022 and September 2023 data were compared as a case study. Data from 2022 were manually input by KYTC employees when configuring BOOTS. The comparison of the data is shown in Figure 4.1.

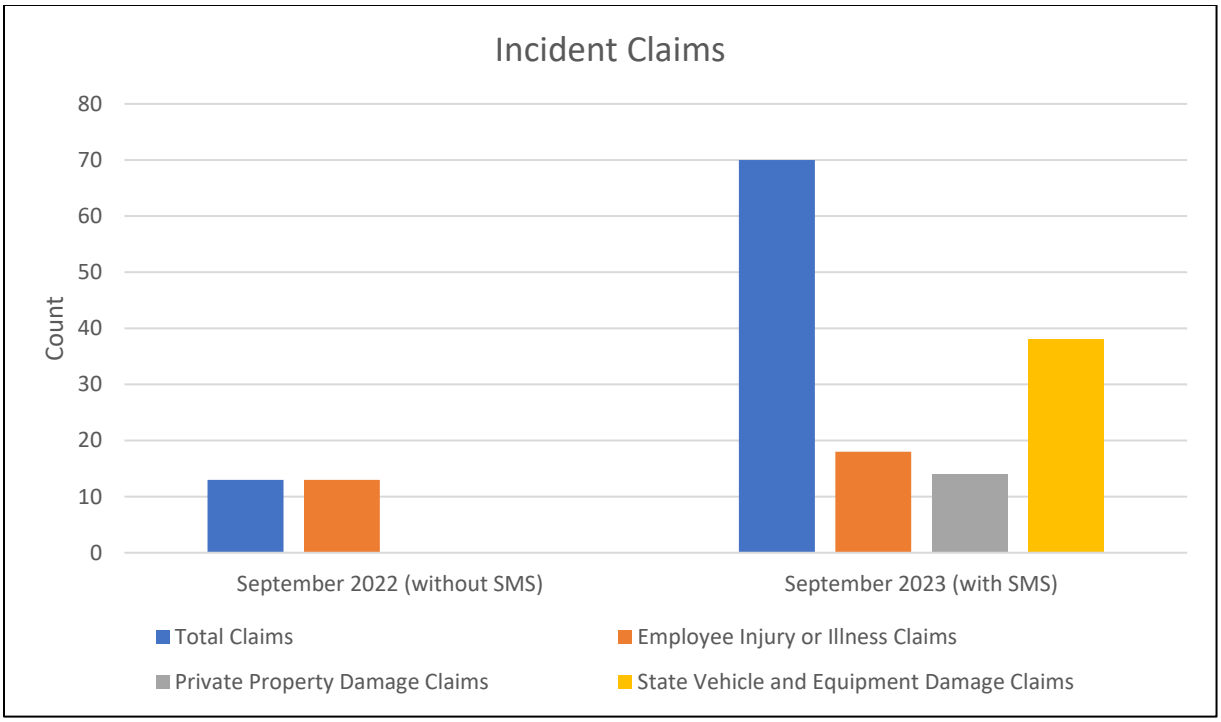


Figure 4.1 Incident Claims Results

4.3 Incident Data Analysis

The research team isolated incidents from September 2022 that were reported without a SMS. In September 2022, there were 13 total reports, and they were all classified as employee injury or illness. In September 2023, 70 incident claims were reported in the SMS. The breakdown showed 18 employee injuries or illnesses, 14 private property damage, and 38 state vehicle and equipment damage (no private property involved). This is approximately five times the number of claims submitted in September 2022. The only claims that can be compared are the employee injury or illness incidents; in September 2022 there were 13 claims and 18 claims in September 2023.

The system can help develop data to show what conditions under which incidents are most likely to happen. This allows the KYTC Secretary's Office of Safety to evaluate current work conditions and identify areas for improvement. The claims being stored in a database can provide details on the root cause of incidents. The data are the support and proof the office needs to develop informed corrective actions to prevent these incidents from happening again. The root cause could be the location, weather, time of day, equipment, or residents. It will give KYTC insight into who, what, where, and why an incident happened. How this information is obtained with the SMS is important to consider. With the SMS, concerns about handwriting and translation of forms can be prevented due to its digital interface. Overall, this is beneficial to the well-being of KYTC employees and KYTC stakeholders.

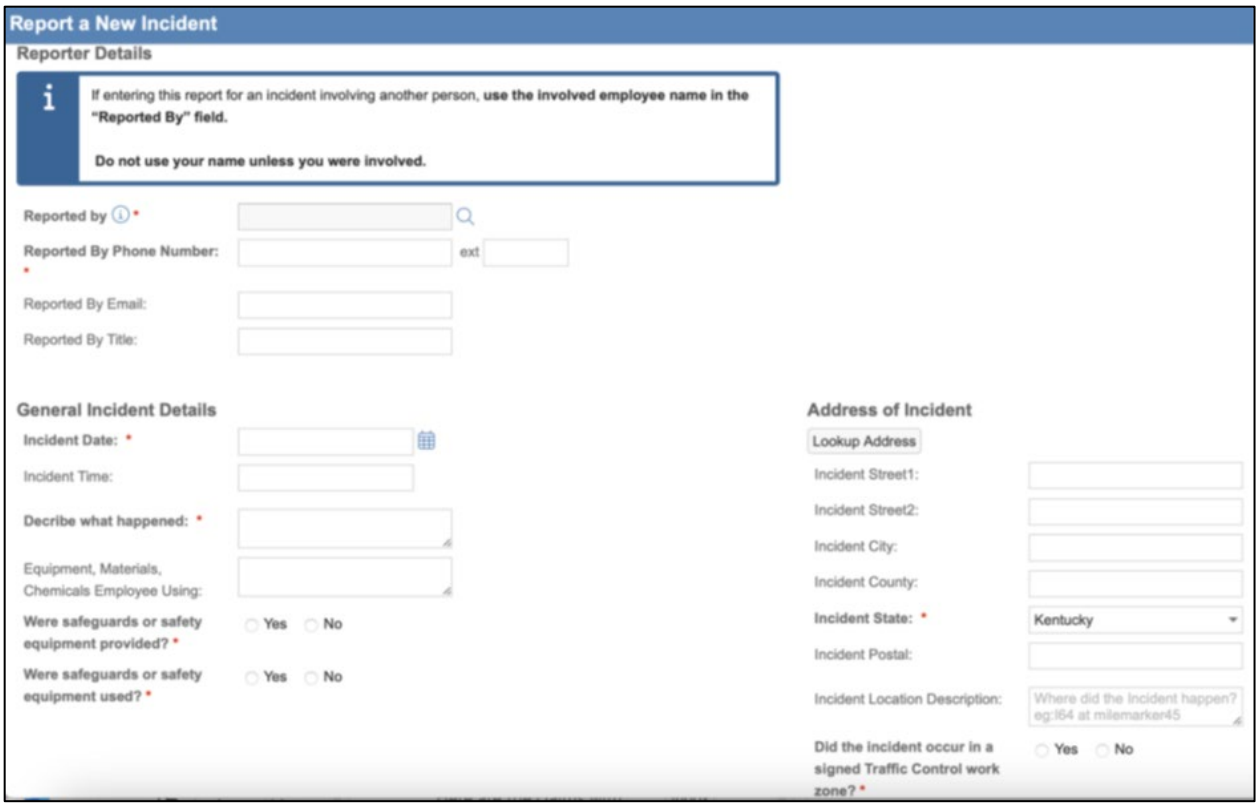


Figure 4.2 BOOTS Incident Claim Report

Another aspect that is critical in incident claims is the occurrence data and reporting date. When comparing incident claim data from September 2022 and September 2023 the research team reviewed turnaround time for this process. In September 2022, 54% of incidents were reported the day they occurred. This compared to 37% in September 2023; however, the September 2023 data also include incidents involving property damage. The Occupational Safety and Health Administration (OSHA) requires that employers report work-related fatalities within 8 hours. OSHA also requires the report of any inpatient hospitalization, amputation, or eye loss that occurs within 24 hours of a work-related incident. However, employers are not required to report incidents stemming from a motor vehicle accident on a public street or highway. Employers are required to report if it occurs in a construction work zone. The Kentucky Personnel Cabinet requires that the first report of injury or illness be completed within three working days of the injury. A short turnaround time ensures more accurate reports. The short turnaround time gives employees a greater chance of remembering details and accurately describing the incident. When reviewing all incident claims in September 2023, 74% were reported within three days. This would help during the investigation process of determining root causes and corrective actions.

4.4 KYTC Safety Opportunity Report Analysis

The SMS is also a place where KYTC employees can take pride in maintaining a safe work environment. Investing in a new SMS was the first step, but in the system, KYTC provides an outlet for employees to anonymously submit safety opportunity reports (SORs). In September 2022, there were 5 SORs and in September 2023 there were also 5 SORs submitted. But one of the five reports in September 2023 was an error duplicate report. SORs essentially cover near misses or safety suggestions. They are a way for employees to contribute to and have a voice in shaping their work environment. When reviewing the SORs, the research team considered how reliable, appropriate, and

actionable they are. Before the BOOTS system rollout, SORs were recorded on paper; they then transitioned to recording them on a third-party reporting website.

In September 2022, two out of five reports were about building safety. One of the reports stated a bullet was found on the floor in a Division of Motor Vehicle Licensing office. The report shared that there was no concern or incident, and they were just sharing the information. The report shared information that could be a concern and appropriately explained that it was an informative report and that no one was in danger. However, there are no precautions that can be taken. The second report stated that two main exit doors were broken and had caution tape on them for some time. This shows a concern for building safety and blocked exits. The report tells us the location of the doors, which helps the reliability of the report. A picture of the specific unsafe condition in the report could have given more information on the situation. This concern is appropriate and actionable due to the knowledge of emergency exit route regulations. The report is an opportunity to correct and improve building safety.

The other three reports were concerns about state vehicles and equipment. They were suggestions for improving safety in general. The topics discussed were a jagged edge in a truck bed and suggestions for equipment that would make a job safer. Maintaining safe state vehicles is a way to keep employees safe. The concern was brought up to a supervisor and the action that could be taken is to schedule maintenance work on the truck bed. The reports that suggested equipment purchases attached links that provided additional information on the equipment. This is appropriate as the field crew uses the current equipment and has firsthand knowledge of the hazards. This is actionable because it can be brought up to leadership to consider.

In September 2023, there were five SORs reported in the SMS. One of the reports was an error duplicate report. The duplicate report stated an employee stepped off a trailer and missed the step. The employee does not provide other information on the conditions leading up to this near miss. Any information like what kind of trailer, time of day, weather, or location can be helpful. Additional details can help KYTC determine the appropriate action. Another report that could have used more detail explained an employee climbed four feet on a truck bed to fuel a slope mower. The employee doesn't include details on who, what, where, and why this happened. The first step would be to talk to a supervisor about possible solutions.

Another report was about a snake coming out of the ground. This is not preventable but the incident raises the importance of discussing with employees animal hazards in a work environment. The last report described the experience of an employee traveling through a work zone where there was only one sign on both ends with a flagger ahead and both flaggers were not standing in an illuminated work area. The report also says no state employee was overseeing the work being performed. The employee states that proper PPE was worn but was still concerned due to the heavily travelled roadway. With the given location and date, the information can be reviewed to determine the conditions. This will provide insight into what can be improved in work zone safety measures.

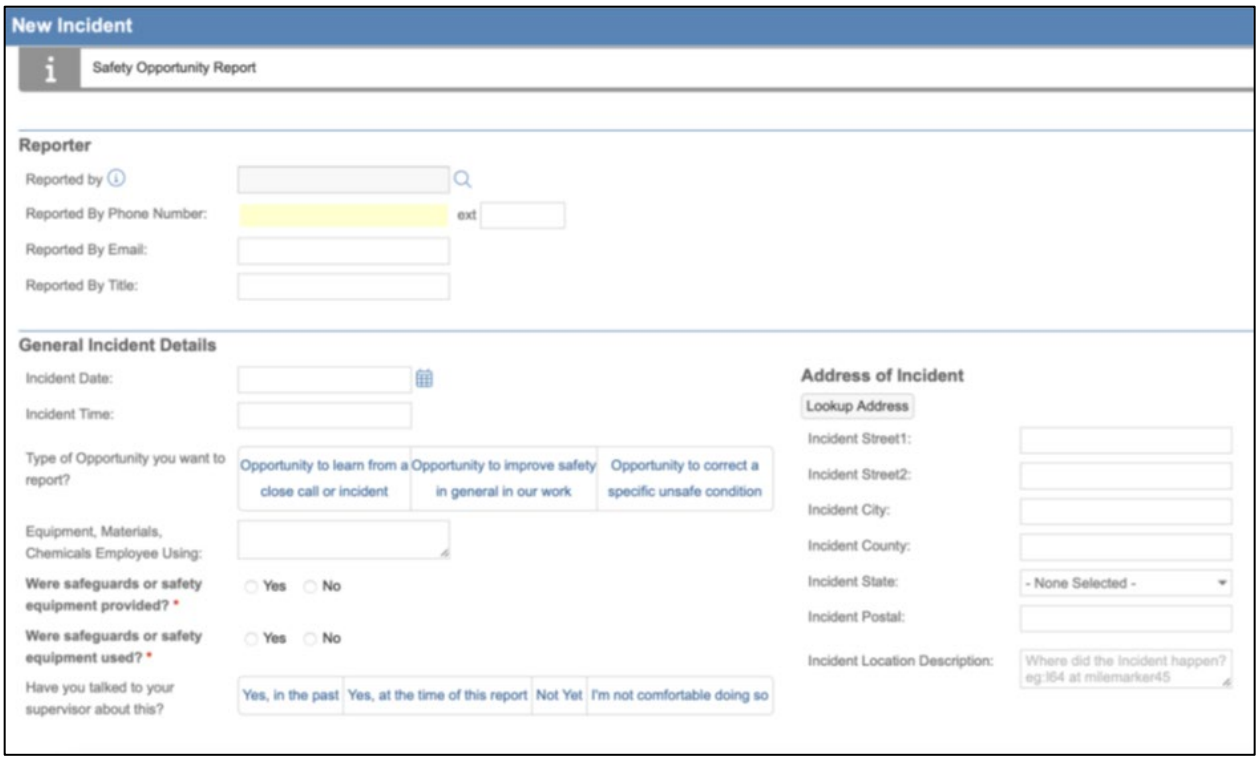


Figure 4.3 BOOTS Safety Opportunity Reports

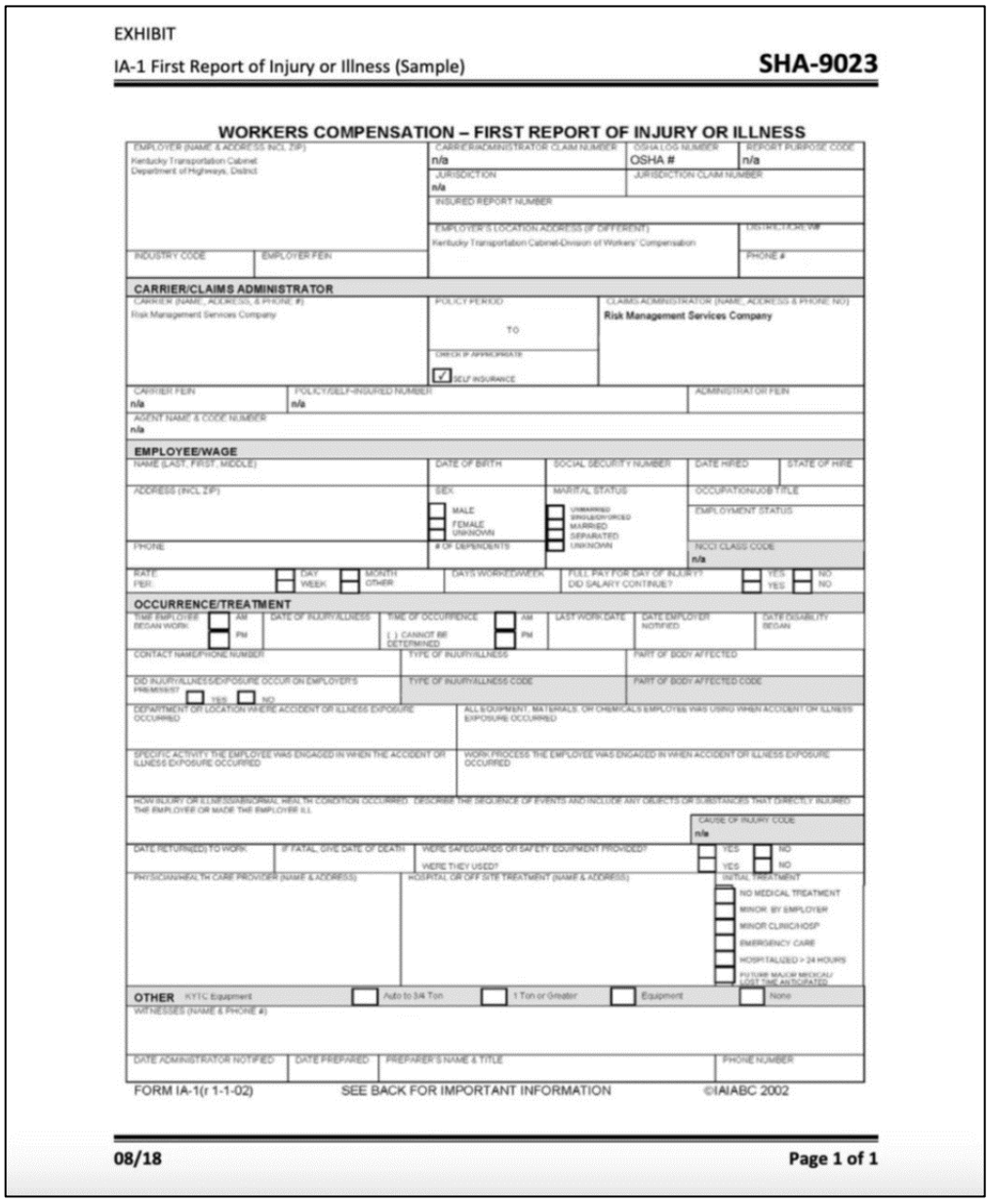
Overall, once the process transitioned for SORs from a website to an app, the average number of reports was similar. The quality of the reports was also comparable. The new SMS can now collect a database of SORs to see if a concern is brought up frequently and where it occurs. This information can be beneficial to KYTC in limiting the number of near misses and creating safer work environments.

4.5 KYTC Worker Compensation Data Analysis

When analyzing worker compensation data, the research team focused on the data from September 2022 and September 2023. Due to personnel data concerns, the focus was on the amount of money paid, the number of claims, and reporting turnaround time. For September 2022, there was a reported $116,942.49 in worker compensation across 14 claims with 2 claims still open. In September 2022, 57% of the claims were reported the same day, 29% were reported the day after, 7% were reported two days after, and 7% were reported five days after. The research team compared this to September 2023 data, when there was a reported $88,938.46 in worker compensation across 13 claims; all 13 claims were still open. In September 2023, 15% were reported the same day, 15% were reported a day after, 15% reported two days after, 8% reported three days after, and 46% reported five or more days after.

The biggest difference is the turnaround time when the incident occurred and when it was reported. This could be explained by the change in process. The system is new and the employees in all departments of KYTC are learning to use it. The lack of confidence in using the new system previously mentioned in the focus groups could be the reason an employee pushed back from filing a claim. In 2022, the worker compensation claims process was done on paper and involved employees coming in person to fill out the form. The process was familiar to everyone, and everyone knew what to expect. This process was tedious but required the employee to be more punctual to get the claim started. The BOOTS system can be accessed anywhere through a mobile device, which can lead to employees procrastinating. The assumption that reporting can wait can have a negative effect on data accuracy. The Kentucky

Personnel Cabinet has a requirement that the first report of injury or illness must be completed within three working days of the injury. The same understanding of short turnaround time applies to incident and worker compensation claims.



EXHIBIT

IA-1 First Report of Injury or Illness (Sample) **SHA-9023**

WORKERS COMPENSATION – FIRST REPORT OF INJURY OR ILLNESS

EMPLOYER (NAME & ADDRESS INCL ZIP): Kentucky Transportation Cabinet Department of Highways, District

CARRIER/ADMINISTRATOR CLAIM NUMBER: n/a | OSHA LOG NUMBER: OSHA # | REPORT PURPOSE CODE: n/a

JURISDICTION: n/a | JURISDICTION CLAIM NUMBER:

INSURED REPORT NUMBER:

EMPLOYER'S LOCATION ADDRESS (IF DIFFERENT): Kentucky Transportation Cabinet-Division of Workers' Compensation | DISTRICT/CITY #: | PHONE #:

INDUSTRY CODE: | EMPLOYER FEIN:

CARRIER/CLAIMS ADMINISTRATOR

CARRIER (NAME, ADDRESS, & PHONE #): Risk Management Services Company

POLICY PERIOD: TO | CHECK IF APPROPRIATE: ☑ SELF INSURANCE

CLAIMS ADMINISTRATOR (NAME, ADDRESS & PHONE NO): **Risk Management Services Company**

CARRIER FEIN: n/a | POLICY/SELF-INSURED NUMBER: n/a | ADMINISTRATOR FEIN:

AGENT NAME & CODE NUMBER: n/a

EMPLOYEE/WAGE

NAME (LAST, FIRST, MIDDLE): | DATE OF BIRTH: | SOCIAL SECURITY NUMBER: | DATE HIRED: | STATE OF HIRE:

ADDRESS (INCL ZIP): | SEX: ☐ MALE ☐ FEMALE ☐ UNKNOWN | MARITAL STATUS: ☐ UNMARRIED (SINGLE/DIVORCED) ☐ MARRIED ☐ SEPARATED ☐ UNKNOWN | OCCUPATION/JOB TITLE: | EMPLOYMENT STATUS:

PHONE: | # OF DEPENDENTS: | NCCI CLASS CODE: n/a

RATE PER: ☐ DAY ☐ WEEK ☐ MONTH ☐ OTHER | DAYS WORKED/WEEK: | FULL PAY FOR DAY OF INJURY? ☐ YES ☐ NO | DID SALARY CONTINUE? ☐ YES ☐ NO

OCCURRENCE/TREATMENT

TIME EMPLOYEE BEGAN WORK: ☐ AM ☐ PM | DATE OF INJURY/ILLNESS: | TIME OF OCCURRENCE: ☐ AM ☐ PM ☐ ( ) CANNOT BE DETERMINED | LAST WORK DATE: | DATE EMPLOYER NOTIFIED: | DATE DISABILITY BEGAN:

CONTACT NAME/PHONE NUMBER: | TYPE OF INJURY/ILLNESS: | PART OF BODY AFFECTED:

DID INJURY/ILLNESS/EXPOSURE OCCUR ON EMPLOYER'S PREMISES? ☐ YES ☐ NO | TYPE OF INJURY/ILLNESS CODE: | PART OF BODY AFFECTED CODE:

DEPARTMENT OR LOCATION WHERE ACCIDENT OR ILLNESS EXPOSURE OCCURRED: | ALL EQUIPMENT, MATERIALS, OR CHEMICALS EMPLOYEE WAS USING WHEN ACCIDENT OR ILLNESS EXPOSURE OCCURRED:

SPECIFIC ACTIVITY THE EMPLOYEE WAS ENGAGED IN WHEN THE ACCIDENT OR ILLNESS EXPOSURE OCCURRED: | WORK PROCESS THE EMPLOYEE WAS ENGAGED IN WHEN ACCIDENT OR ILLNESS EXPOSURE OCCURRED:

HOW INJURY OR ILLNESS/ABNORMAL HEALTH CONDITION OCCURRED. DESCRIBE THE SEQUENCE OF EVENTS AND INCLUDE ANY OBJECTS OR SUBSTANCES THAT DIRECTLY INJURED THE EMPLOYEE OR MADE THE EMPLOYEE ILL:

CAUSE OF INJURY CODE: n/a

DATE RETURNED TO WORK: | IF FATAL, GIVE DATE OF DEATH: | WERE SAFEGUARDS OR SAFETY EQUIPMENT PROVIDED? ☐ YES ☐ NO | WERE THEY USED? ☐ YES ☐ NO

PHYSICIAN/HEALTH CARE PROVIDER (NAME & ADDRESS): | HOSPITAL OR OFF SITE TREATMENT (NAME & ADDRESS): | INITIAL TREATMENT: ☐ NO MEDICAL TREATMENT ☐ MINOR BY EMPLOYER ☐ MINOR CLINIC/HOSP ☐ EMERGENCY CARE ☐ HOSPITALIZED > 24 HOURS ☐ FUTURE MAJOR MEDICAL/LOST TIME ANTICIPATED

OTHER KYTC Equipment ☐ Auto to 3/4 Ton ☐ 1 Ton or Greater ☐ Equipment ☐ None

WITNESSES (NAME & PHONE #):

DATE ADMINISTRATOR NOTIFIED: | DATE PREPARED: | PREPARER'S NAME & TITLE: | PHONE NUMBER:

FORM IA-1(r 1-1-02) SEE BACK FOR IMPORTANT INFORMATION ©IAIABC 2002

08/18 **Page 1 of 1**

Figure 4.4 Sample of First Report of Injury or Illness

4.6 Evaluation of the BOOTS System Data

Evaluation of the BOOTS system involved analyzing data collected through a comprehensive survey distributed to KYTC staff. The survey was designed to capture feedback on multiple aspects of the BOOTS system, including its usage, training effectiveness, functionality, technical issues, privacy concerns, and overall user perception. The data collected provided valuable insights into the system's performance, areas for improvement, and its impact on safety measures within the organization.

4.6.1 Respondent Characteristics

A total of 859 participants took part in the survey. Participants were distributed across the 12 districts and Central Office, with the highest percentage originating from the Central Office. Respondents were categorized into Field and Office roles, with most being office-based employees. Respondent age distribution covered a broad spectrum, with a significant number of participants in the mid to late stages of their careers. Experience levels among respondents varied, providing balanced representation. Figures 4.5 – 4.8 illustrate these distributions.

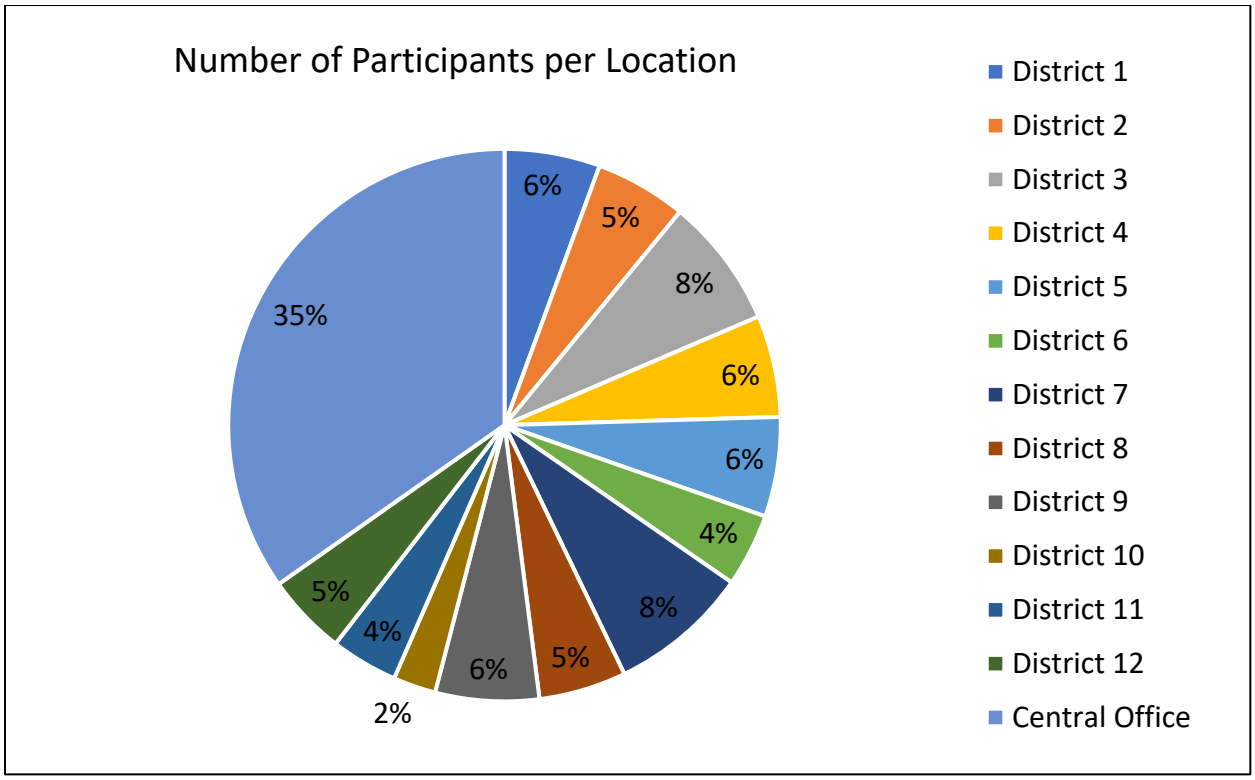


Figure 4.5 Distribution of Participants Across KYTC Districts

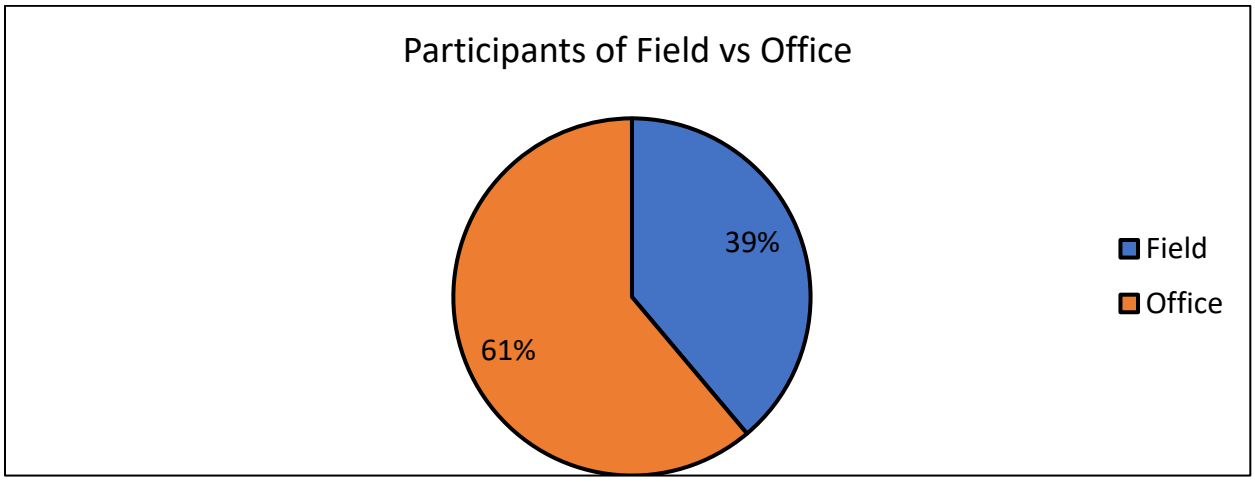


Figure 4.6 Field vs Office Participants

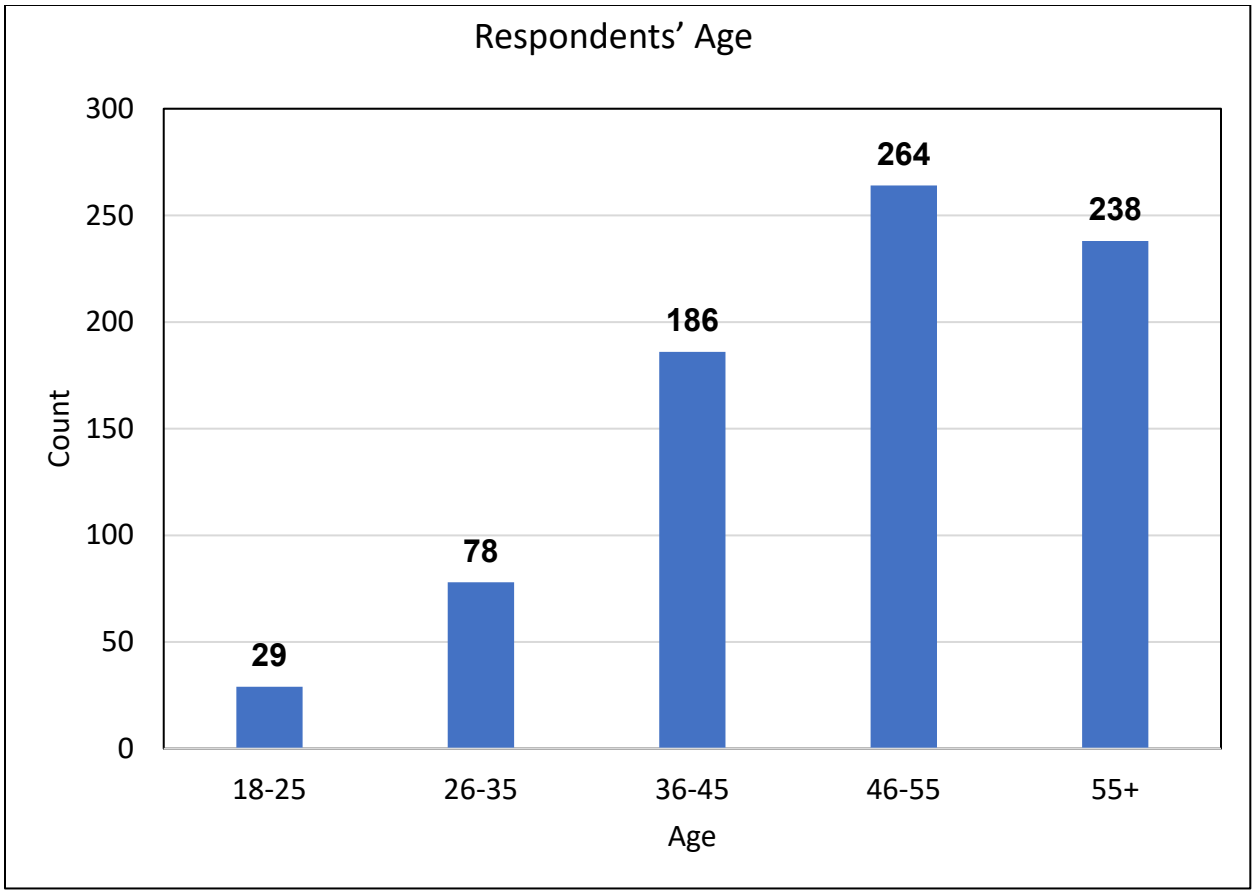


Figure 4.7 Age Distribution of Respondents

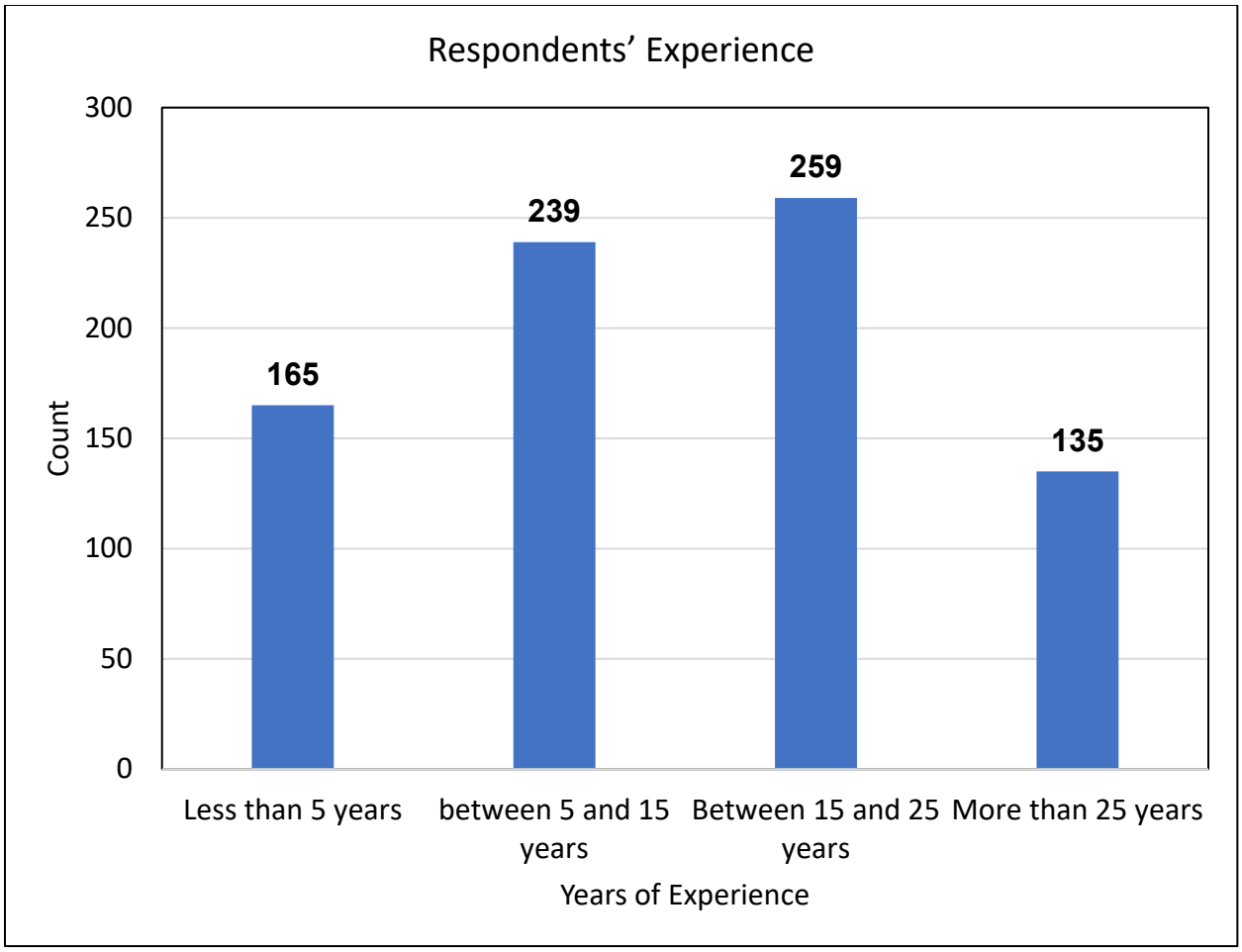


Figure 4.8 Experience Levels of Respondents

4.6.2 BOOTS System General Use

The survey revealed that a considerable portion of employees had not used the BOOTS system. Specifically, 72.8% of field workers and 78.9% of office workers reported not using it. Among those who had used the system, field workers and office workers showed varying durations of usage. In the field, 23% of users had engaged with the BOOTS system for less than a month, another 23% for 1 to 3 months, 23% for 3 to 6 months, and 28% for more than 6 months. In the office, 22% had used it for less than a month, 15% for 1 to 3 months, 22% for 3 to 6 months, and 42% for more than 6 months. These statistics indicate a slightly longer duration of use among office workers than field workers.

The survey assessed the perceived user-friendliness of the BOOTS system among both field and office workers. Among field users, 2% found it extremely difficult, 21% somewhat difficult, 28% neither easy nor difficult, 37% somewhat easy, and 13% extremely easy. Office users had similar perceptions, with 6% finding it extremely difficult, 12% somewhat difficult, 34% neither easy nor difficult, 37% somewhat easy, and 13% extremely easy. These results suggest a varied but generally moderate level of ease of use, with many users finding it somewhat easy to use.

The frequency of BOOTS system usage was another critical aspect explored in the survey. Among field workers, 68% reported using the system rarely, 17% monthly, 10% weekly, and 3% daily. For office workers, 48% used it rarely, 15% monthly, 23% weekly, and 12% daily. These data indicate that while the BOOTS system is not frequently used

by most field workers, a notable percentage of office workers engage with it more regularly, especially on a weekly and daily basis.

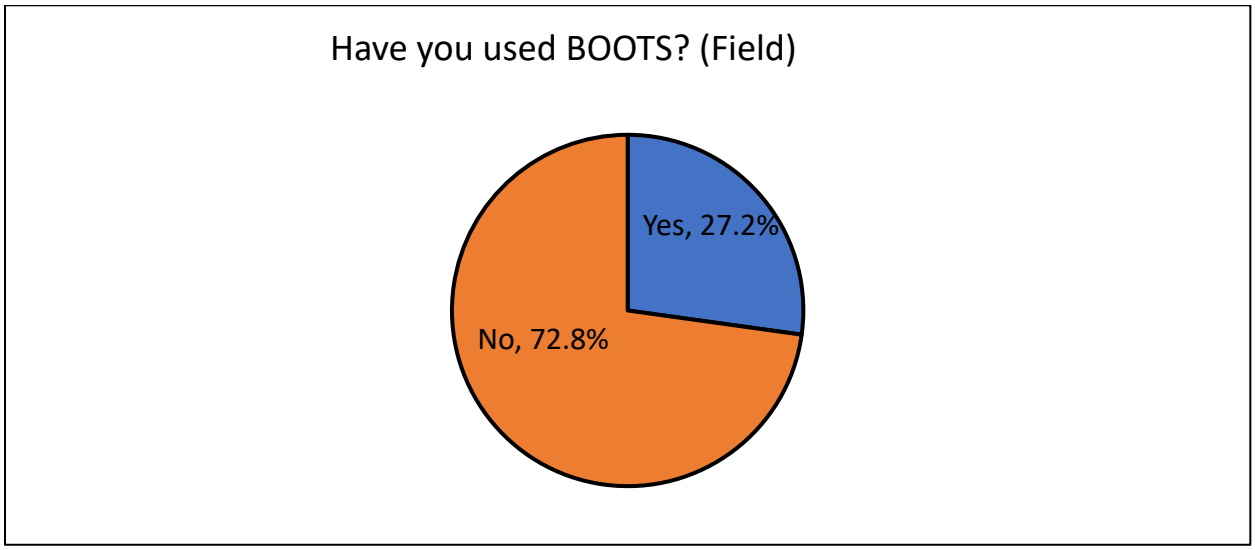


Figure 4.9 BOOTS System Usage Among Field Employees

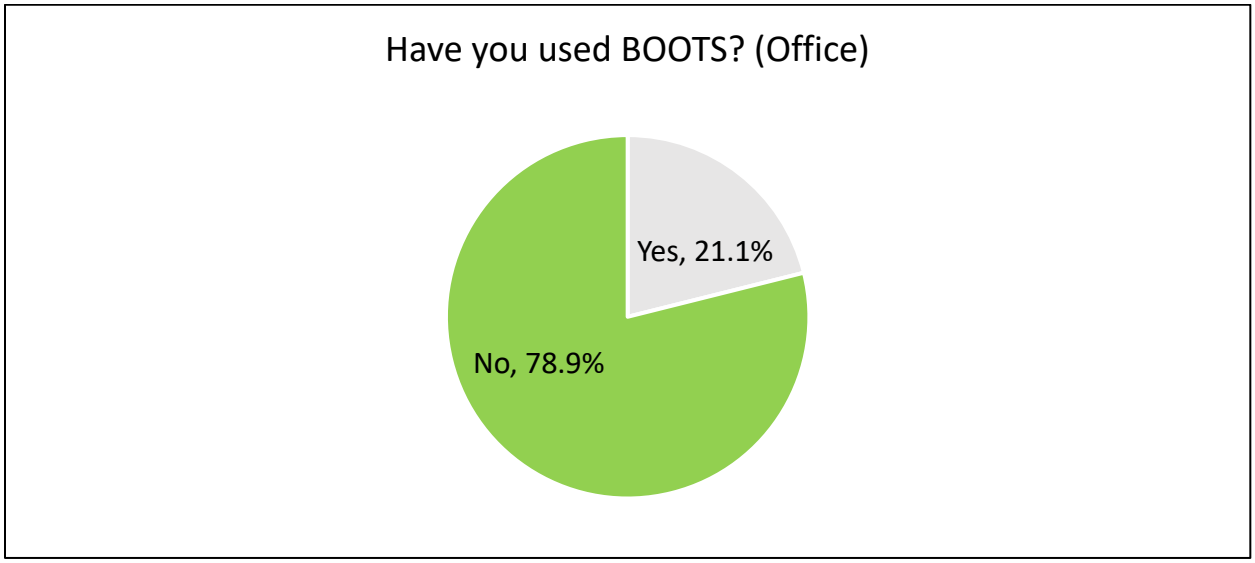


Figure 4.10 BOOTS System Usage Among Office Employees

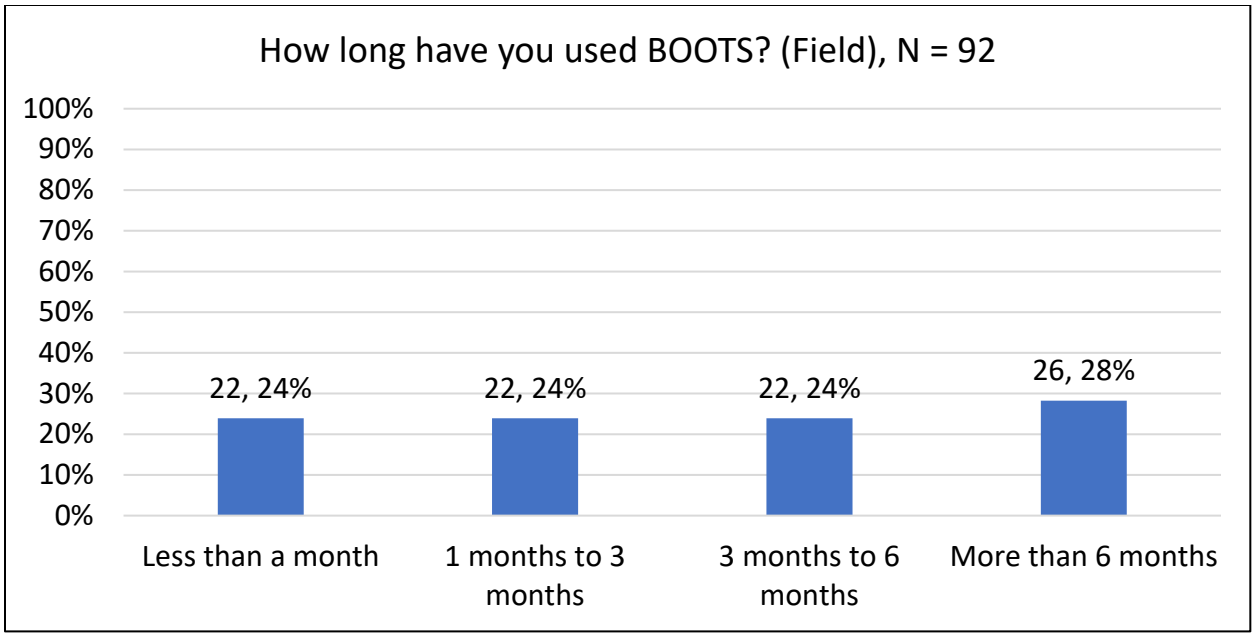


Figure 4.11 Duration of BOOTS System Usage (Field Employees)

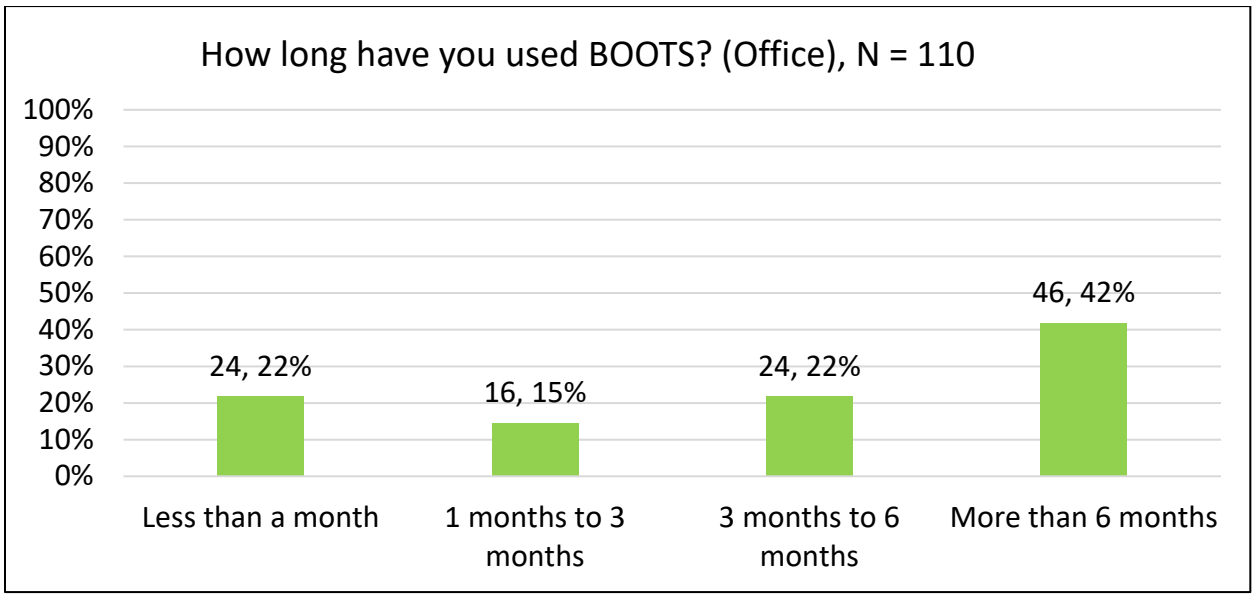


Figure 4.12 Duration of BOOTS System Usage (Office Employees)

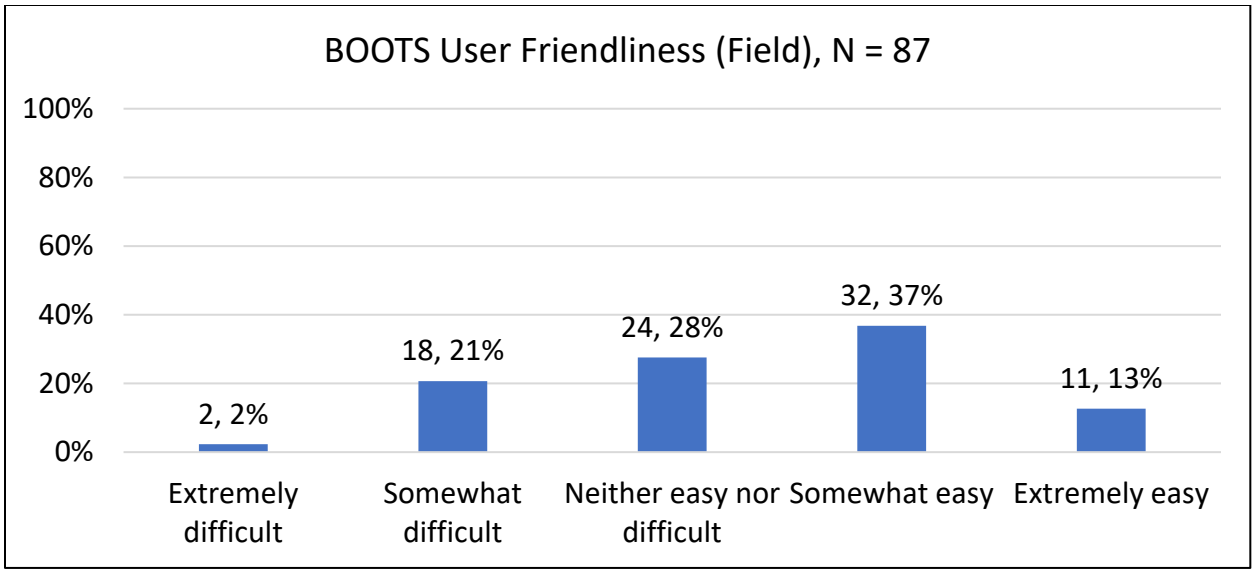


Figure 4.13 BOOTS System User Friendliness (Field Employees)

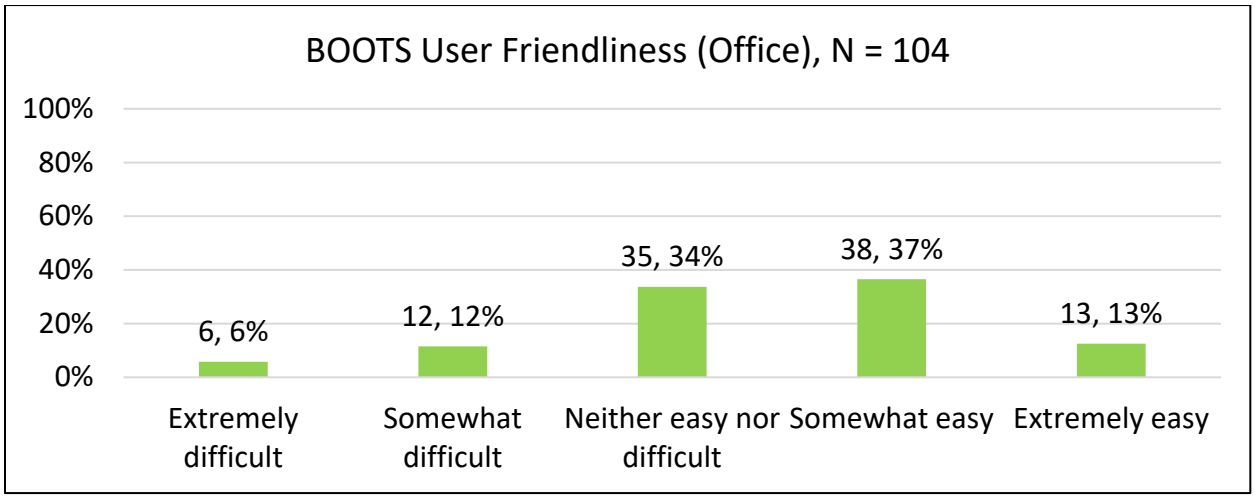


Figure 4.14 BOOTS System User Friendliness (Office Employees)

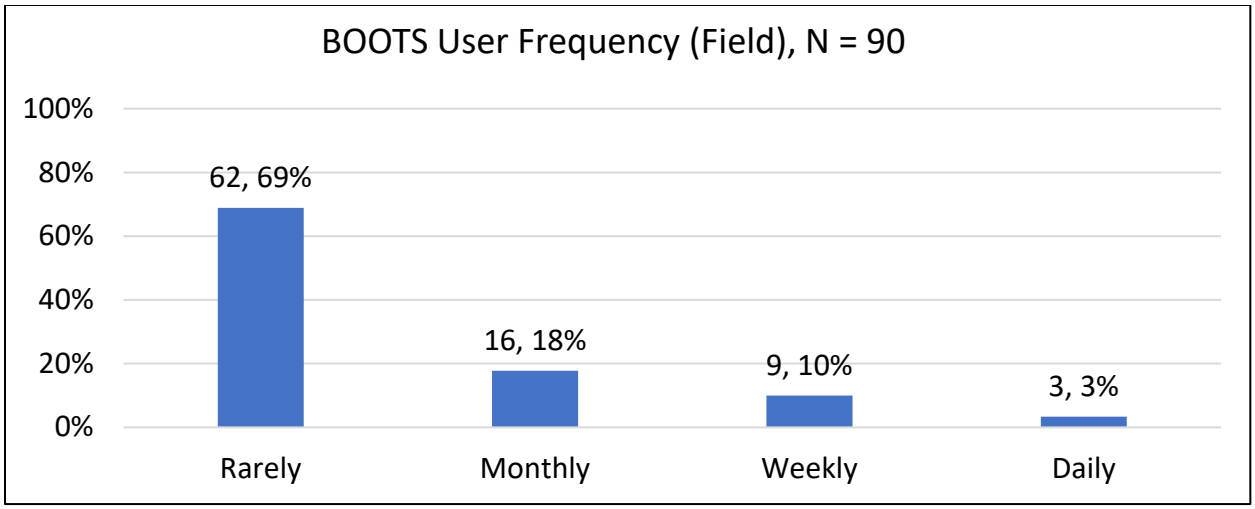


Figure 4.15 BOOTS System Usage Frequency (Field Employees)

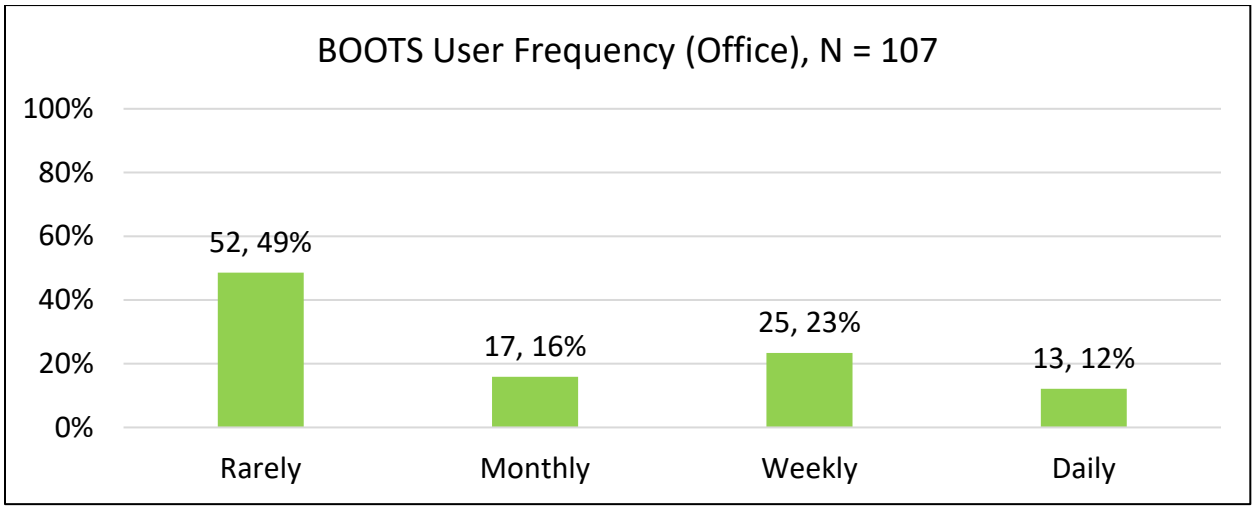


Figure 4.16 BOOTS System Usage Frequency (Office Employees)

4.6.3 BOOTS System Training and Resources

The survey included several questions to evaluate the training and resources provided to employees for the BOOTS system. The results offer insights into the adequacy of training, the availability and usefulness of resources, and the overall satisfaction with training.

The survey asked if employees received BOOTS system training. Among field workers, 50.6% reported receiving training, while 49.4% did not. In contrast, 48.7% of office workers received training, and 51.3% did not. This indicates a nearly even split in training provision across both groups, highlighting a potential area for improvement in ensuring all employees receive adequate training.

Regarding the provision of necessary resources, 70.9% of field workers indicated they received the required resources, whereas 29.1% did not. Among office workers, 63.5% reported receiving the needed resources, with 36.5% stating otherwise. These findings suggest that while most employees received resources, a significant proportion did not, pointing to the need for better resource allocation and distribution.

The adequacy of the training provided was also assessed. Among field workers, 20% felt the training was not sufficient, 30% found it somewhat helpful, and 50% considered it sufficient. Office workers had similar responses, with 7% indicating insufficient training, 44% finding it somewhat helpful, and 49% deeming it sufficient. These results show that while many employees found the training adequate, a substantial number felt it was either insufficient or only somewhat helpful, indicating room for enhancement in training programs.

The survey evaluated the usefulness of different training resources, including PDF documentation, recorded videos, one-on-one virtual training, and in-person training.

Field Employees:

- PDF Documentation: 11% were not provided with this resource; 4% were extremely dissatisfied, 7% somewhat dissatisfied, 28% neither satisfied nor dissatisfied, 35% somewhat satisfied, and 15% extremely satisfied.
- Recorded Videos: 34% were not provided with this resource; 4% were extremely dissatisfied, 6% somewhat dissatisfied, 28% neither satisfied nor dissatisfied, 18% somewhat satisfied, and 10% extremely satisfied.
- One-on-One Virtual Training: 44% were not provided with this resource; 4% were extremely dissatisfied, 4% somewhat dissatisfied, 20% neither satisfied nor dissatisfied, 22% somewhat satisfied, and 6% extremely satisfied.
- One-on-One In-Person Training: 27% were not provided with this resource; 2% were extremely dissatisfied, 5% somewhat dissatisfied, 20% neither satisfied nor dissatisfied, 31% somewhat satisfied, and 15% extremely satisfied.
- Other Resources: 25% were not provided with these resources; 0% were extremely dissatisfied, 8% somewhat dissatisfied, 8% neither satisfied nor dissatisfied, 42% somewhat satisfied, and 17% extremely satisfied.

Office Employees:

- PDF Documentation: 25% were not provided with this resource; 0% were extremely dissatisfied, 0% somewhat dissatisfied, 25% neither satisfied nor dissatisfied, 30% somewhat satisfied, and 21% extremely satisfied.
- Recorded Videos: 28% were not provided with this resource; 3% were extremely dissatisfied, 0% somewhat dissatisfied, 28% neither satisfied nor dissatisfied, 26% somewhat satisfied, and 15% extremely satisfied.
- One-on-One Virtual Training: 32% were not provided with this resource; 0% were extremely dissatisfied, 5% somewhat dissatisfied, 32% neither satisfied nor dissatisfied, 20% somewhat satisfied, and 12% extremely satisfied.
- One-on-One In-Person Training: 30% were not provided with this resource; 0% were extremely dissatisfied, 4% somewhat dissatisfied, 30% neither satisfied nor dissatisfied, 27% somewhat satisfied, and 9% extremely satisfied.
- Other Resources: 22% were not provided with these resources; 6% were extremely dissatisfied, 0% somewhat dissatisfied, 22% neither satisfied nor dissatisfied, 33% somewhat satisfied, and 17% extremely satisfied.

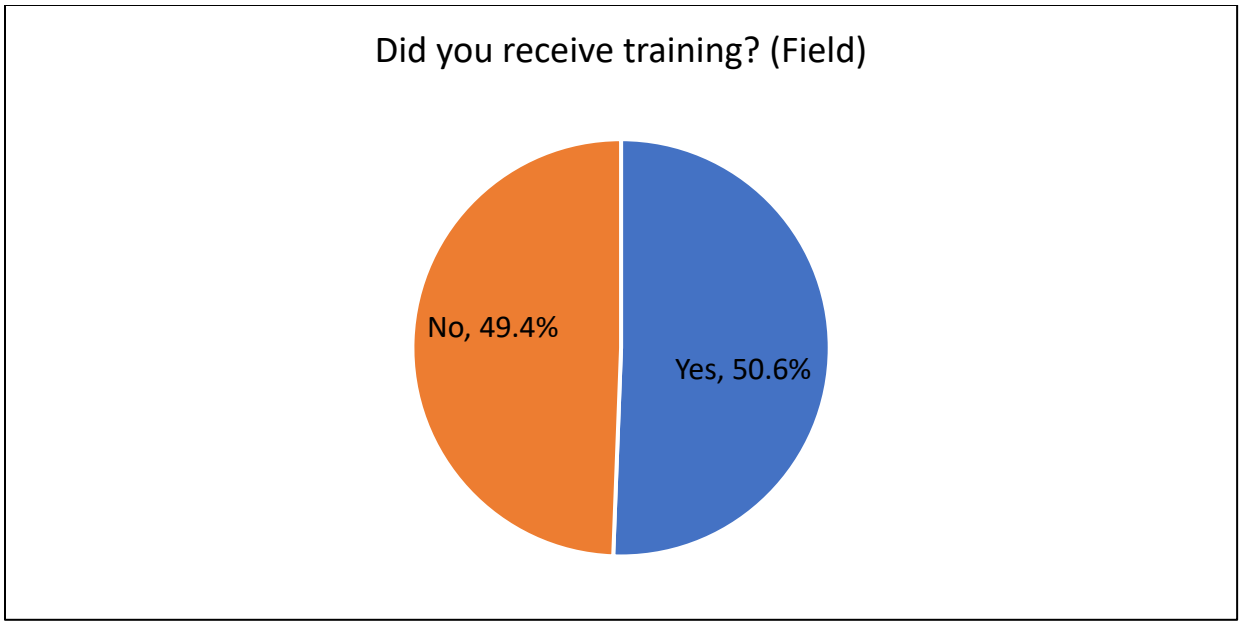


Figure 4.17 Training Received by Field Employees for BOOTS System

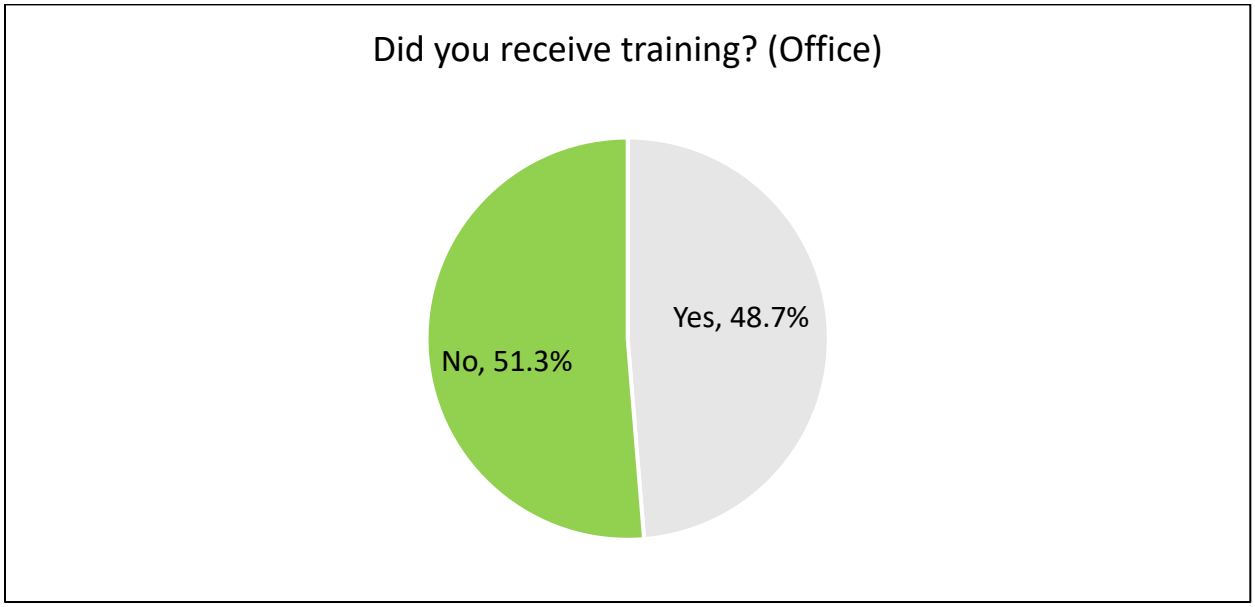


Figure 4.18 Training Received by Office Employees for BOOTS System

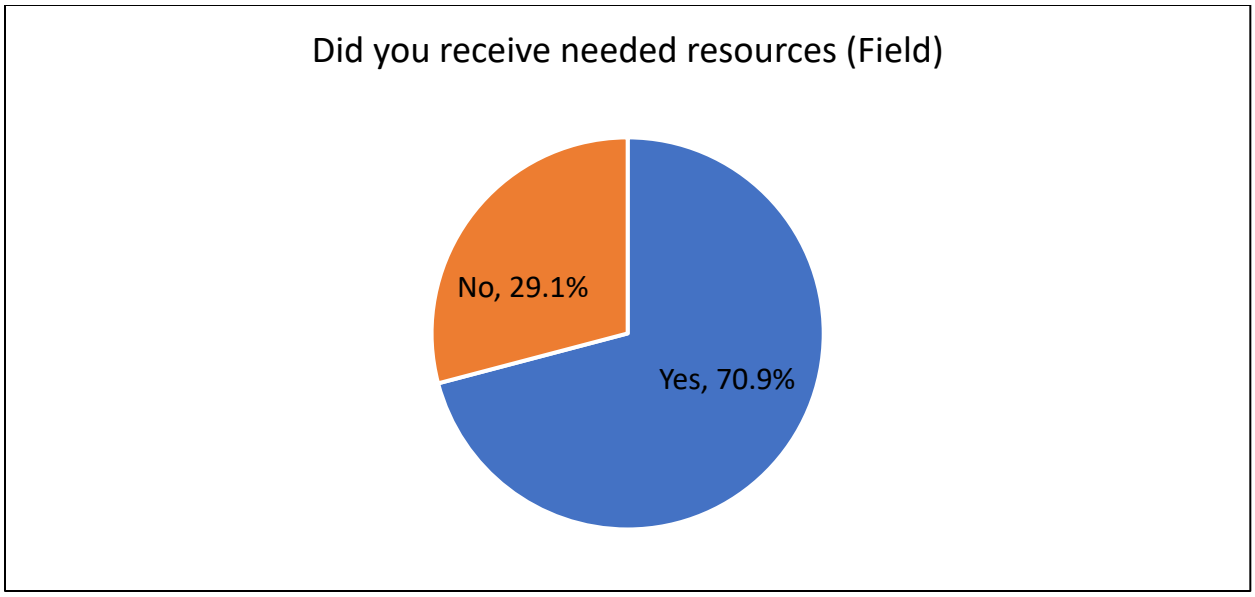


Figure 4.19 Availability of Necessary Resources for Field Employees

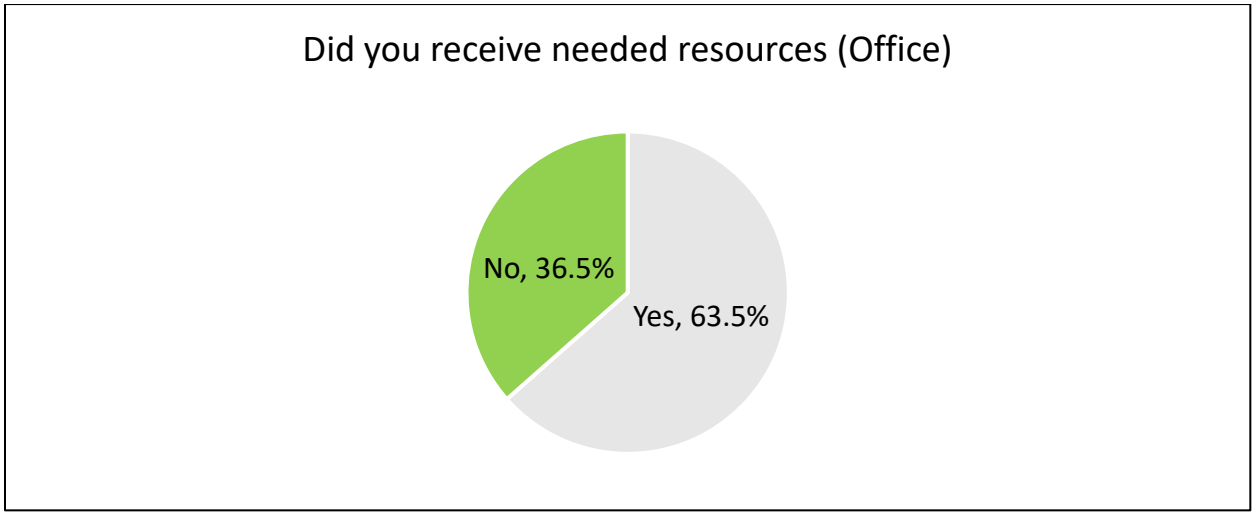


Figure 4.20 Availability of Necessary Resources for Office Employees

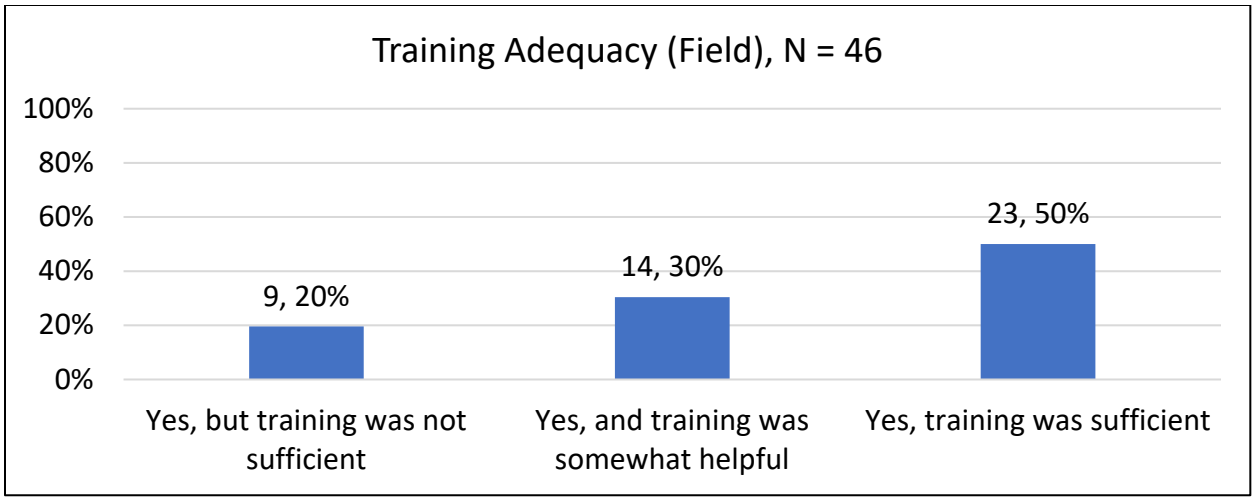


Figure 4.21 Training Adequacy Perceived by Field Employees

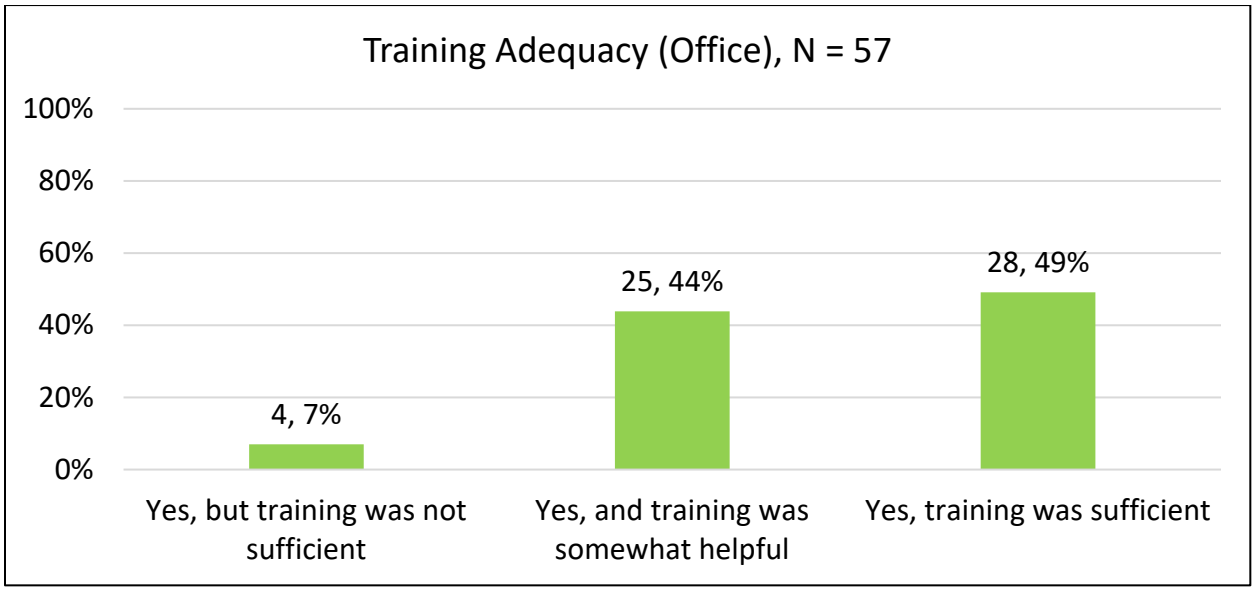


Figure 4.22 Training Adequacy Perceived by Office Employees

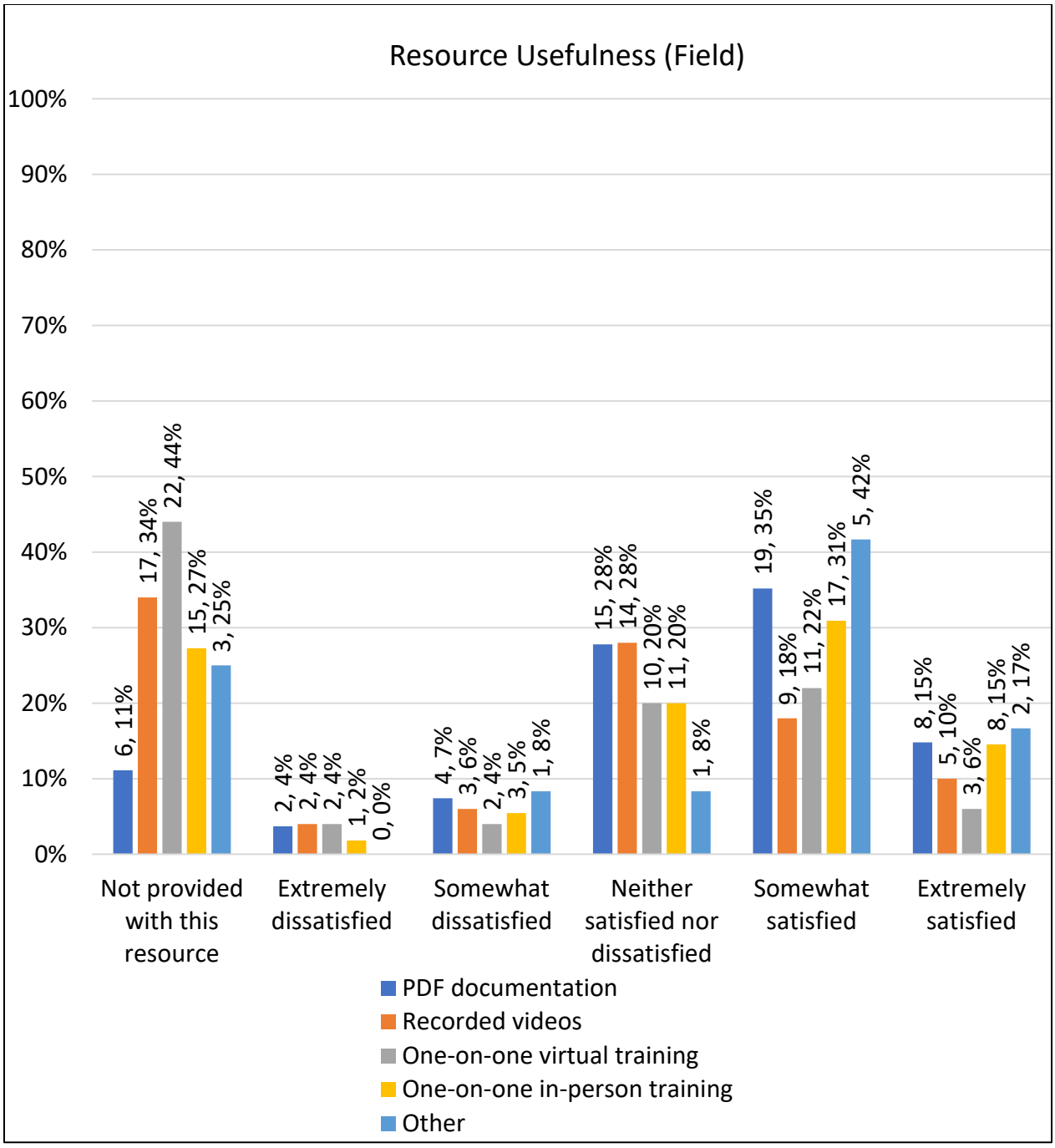


Figure 4.23 Usefulness of Training Resources for Field Employees

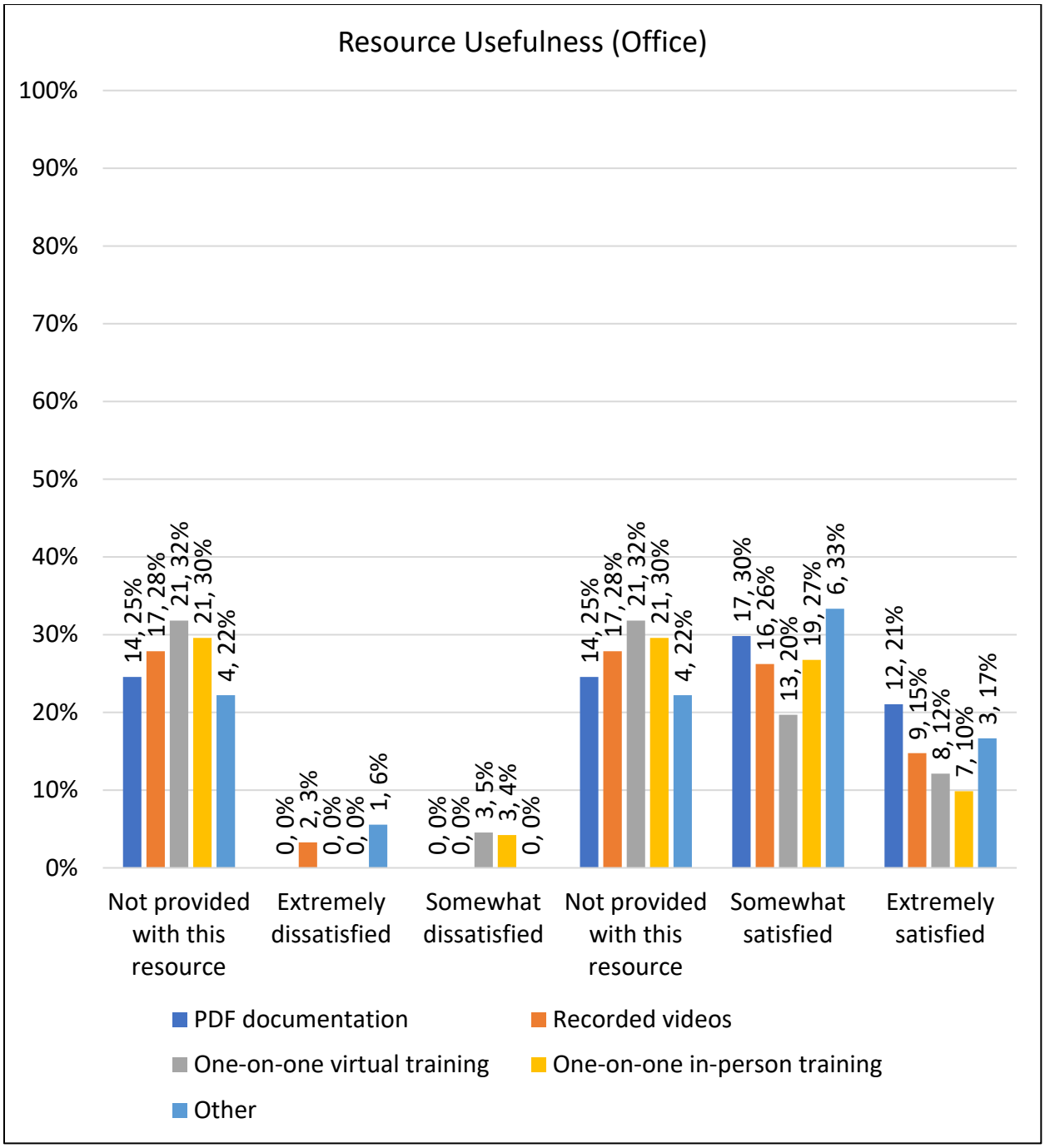


Figure 4.24 Usefulness of Training Resources for Office Employees

4.6.4 BOOTS System Functionality

Analysis of BOOTS system functionality from the survey provides insights into which features are most useful and which pose challenges for users. This section evaluates the effectiveness of various functionalities within the system as perceived by field and office workers. Survey results reveal both the strengths of the system in enhancing safety and the areas needing improvement to better support users in their daily tasks.

Results indicate that submitting safety incident reports and tracking related data are the most valued features among both field and office employees. This highlights the importance of these functionalities in improving safety oversight and management. The data suggest that tracking safety reports and submitting related claims are challenging for many users, pointing to potential areas for system enhancement, such as simplifying these processes and providing more user-friendly interfaces.

The thematic analysis of the survey responses for two key questions — identifying the most useful features and the most challenging aspects of the BOOTS system — revealed distinct themes for both field and office employees. For field employees, the most useful features included effective task delegation and monitoring, with specific emphasis on submitting safety incident reports and automated report generation. However, they found the system's interface and functionality challenging, citing issues with process efficiency, privacy concerns, and the tedious nature of certain tasks, underscoring the need for better training and support. Office employees valued the system's capability in managing notifications, paperwork, and generating automated reports but encountered difficulties due to inadequate information, limited familiarity with some features, and the incomplete implementation of certain functions. These insights highlight critical areas for improvement in both user interfaces and training programs to enhance the overall usability and effectiveness of the BOOTS system.

BOOTS Useful Functions - Themes

What specific features of the software have been most useful in improving safety in your daily KYTC tasks?

Field

- Delegation and Monitoring

Office

- Notifications and Paperwork Management
- Automated Report Generation

BOOTS Difficult Functions - Themes

Are there any features or functions that you found difficult to use or that you believe could be improved?

Field

- Interface and Functionality
- Process Efficiency and Privacy Concerns
- Tedious and Confusing Processes
- Training and Support

Office

- Inadequate Information or Details
- Limited Usage or Familiarity
- Incomplete or Ongoing Implementation

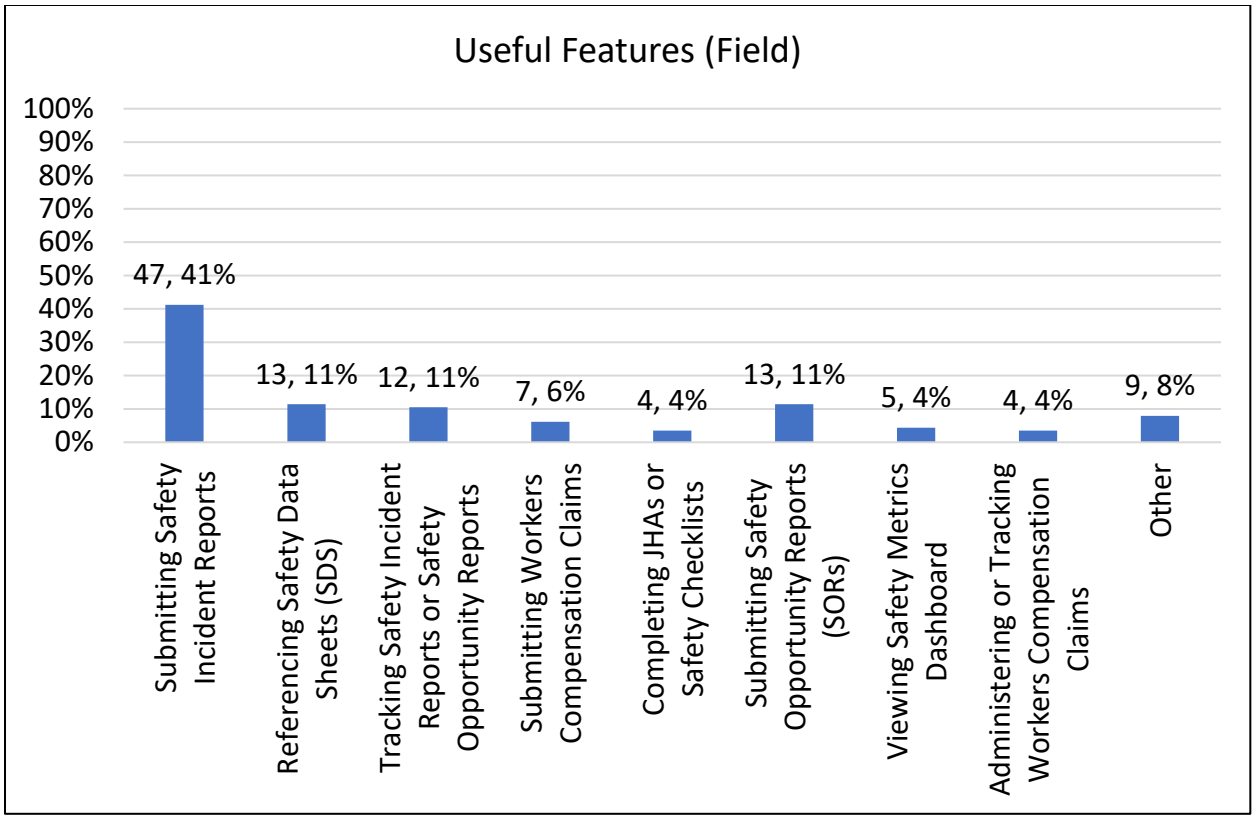


Figure 4.25 Useful Features of the BOOTS System for Field Employees

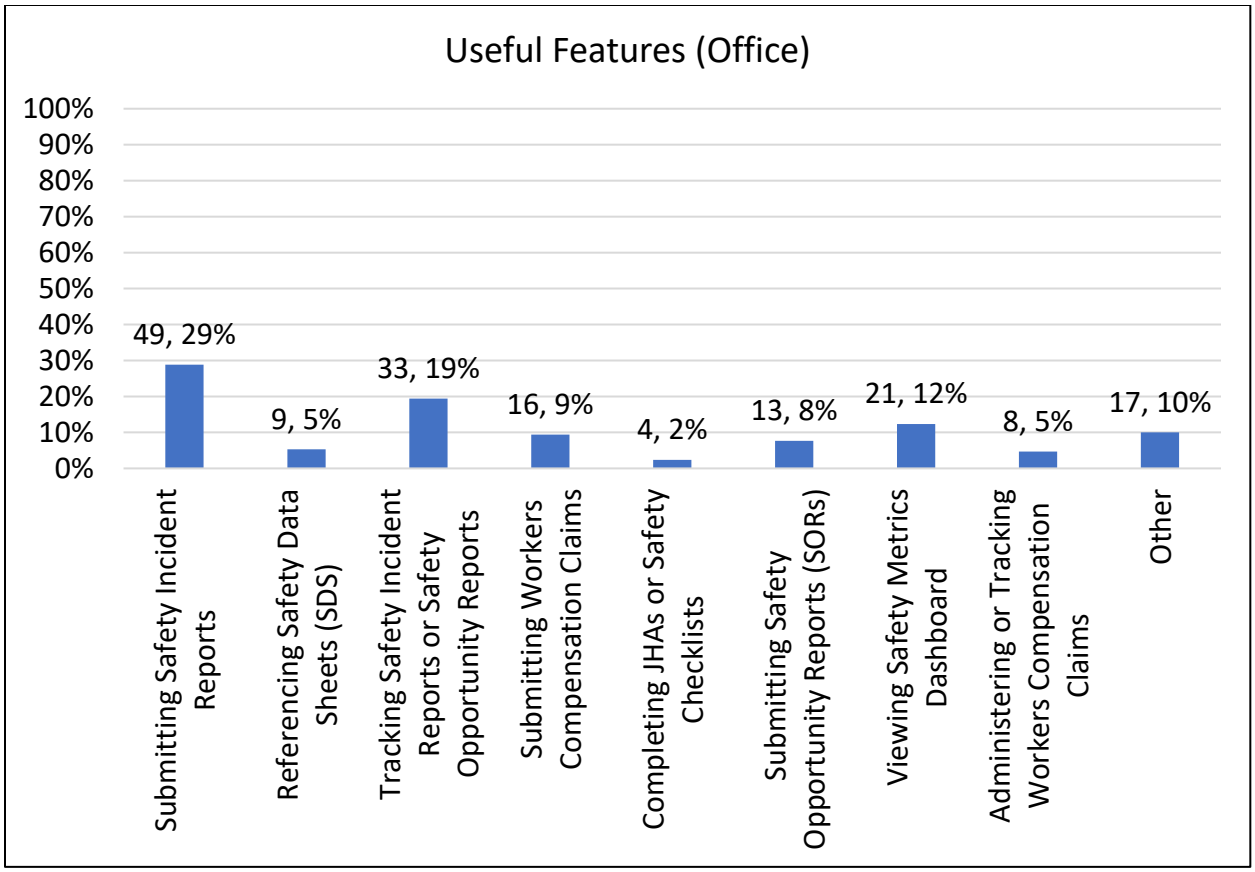


Figure 4.26 Useful Features of the BOOTS System for Office Employees

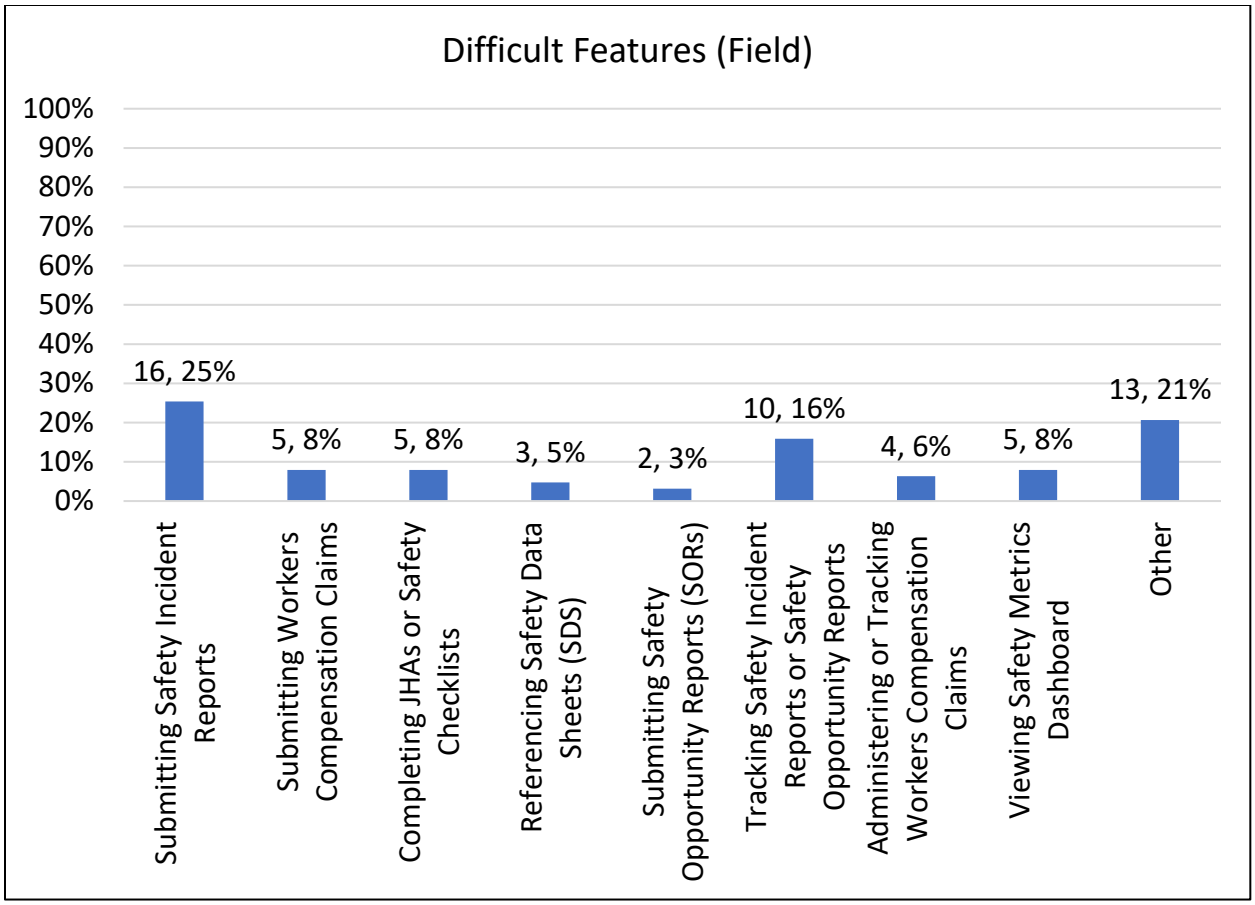


Figure 4.27 Challenging Features of the BOOTS System for Field Employees

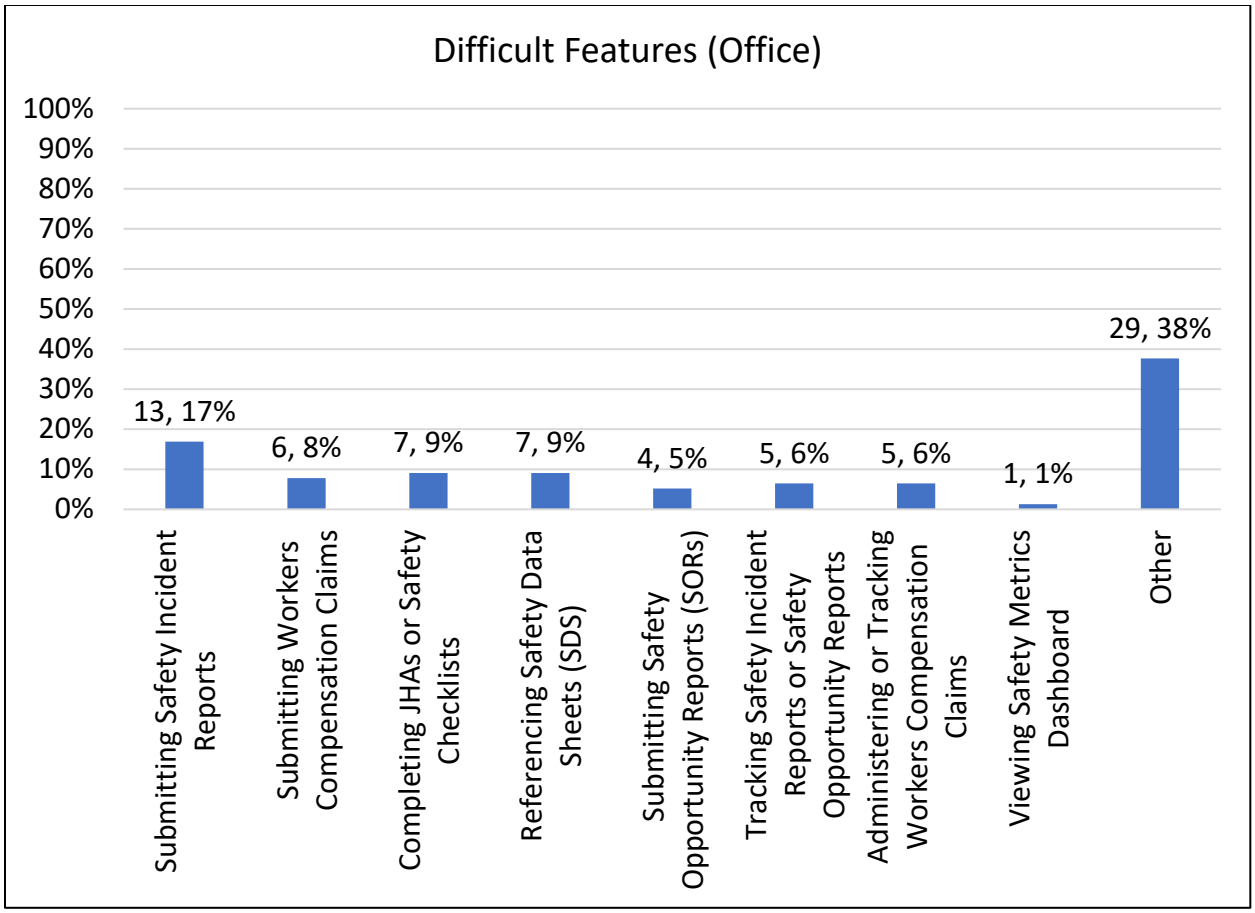


Figure 4.28 Challenging Features of the BOOTS System for Office Employees

4.6.5 BOOTS System Challenges/Concerns

The analysis of technical issues encountered by users of the BOOTS system revealed distinct challenges faced by field and office workers. Field workers reported access issues, poor system performance, difficulties with photo/image uploads, and confusing information. Office workers, on the other hand, experienced problems with the initial setup, communication issues, duplicate information, access issues, and reporting issues. These technical difficulties suggest a need for system improvements to enhance user experience and efficiency.

Privacy and security issues were another critical area explored in the survey. Field workers expressed concerns about the exposure of personal information and the potential for data misuse, while office workers were worried about the level of access and visibility of employee information within the system. These concerns highlight the importance of robust security measures and clear communication about data protection practices to build user trust.

The responsiveness of the support or help desk was also evaluated. Among field workers, satisfaction levels varied, with some expressing extreme dissatisfaction and others being extremely satisfied. Office workers had a similar range of responses — some users found the support helpful, but others experienced delays or felt the assistance was insufficient. This feedback underscores the importance of delivering consistent and effective support services to address user issues promptly.

Thematic analysis of the survey responses highlights several key challenges faced by users of the BOOTS system. Technical issues such as access problems, poor system performance, and confusing information were prevalent among field workers, while office workers encountered difficulties with initial setup, communication, and duplicate information. Privacy and security concerns, particularly regarding the exposure and visibility of personal data, were significant for both groups. Additionally, the mixed satisfaction levels with the support services indicate a need for improvements in responsiveness and effectiveness. Addressing these challenges through system enhancements, robust security measures, and better support services will be crucial for improving the overall functionality and user satisfaction with the BOOTS system.

BOOTS Technical Issues – Themes

What, if any, technical issues have you encountered while using the software?

Field

- Access Issues
- System Performance
- Photo/Image Upload Issues
- Confusing Information

Office

- Initial Setup
- Communication Issues
- Duplicate Information
- Access Issues
- Reporting Issues

Safety

- Distribution Issues

BOOTS Privacy and Security Issues – Themes

What, if any, concerns or reservations do you have about the privacy and security of the data you input into the software?

Field

- Exposure of personal information

Office

- Level of access and visibility of employee information within the system

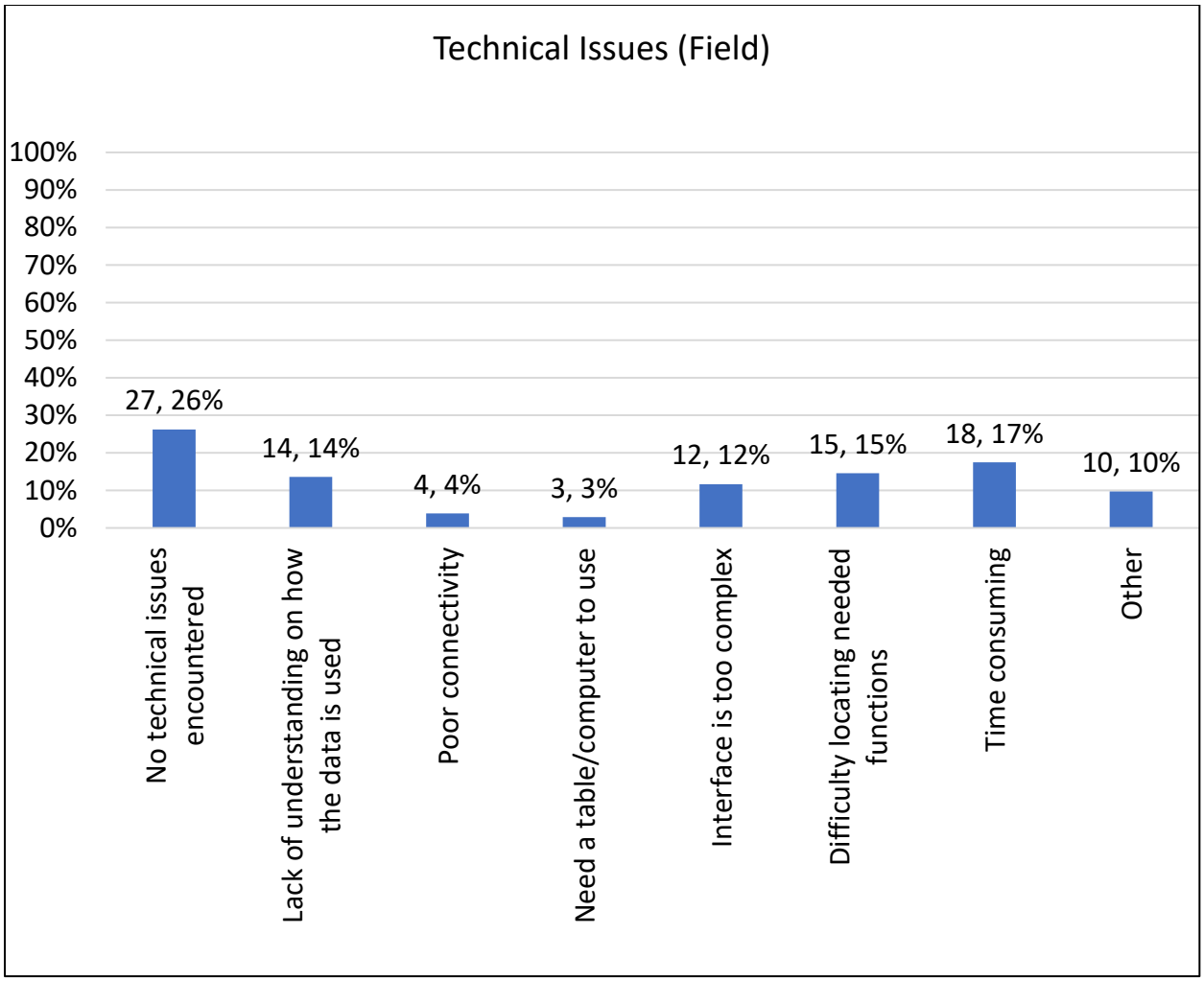


Figure 4.29 Technical Issues Encountered by Field Employees Using the BOOTS System

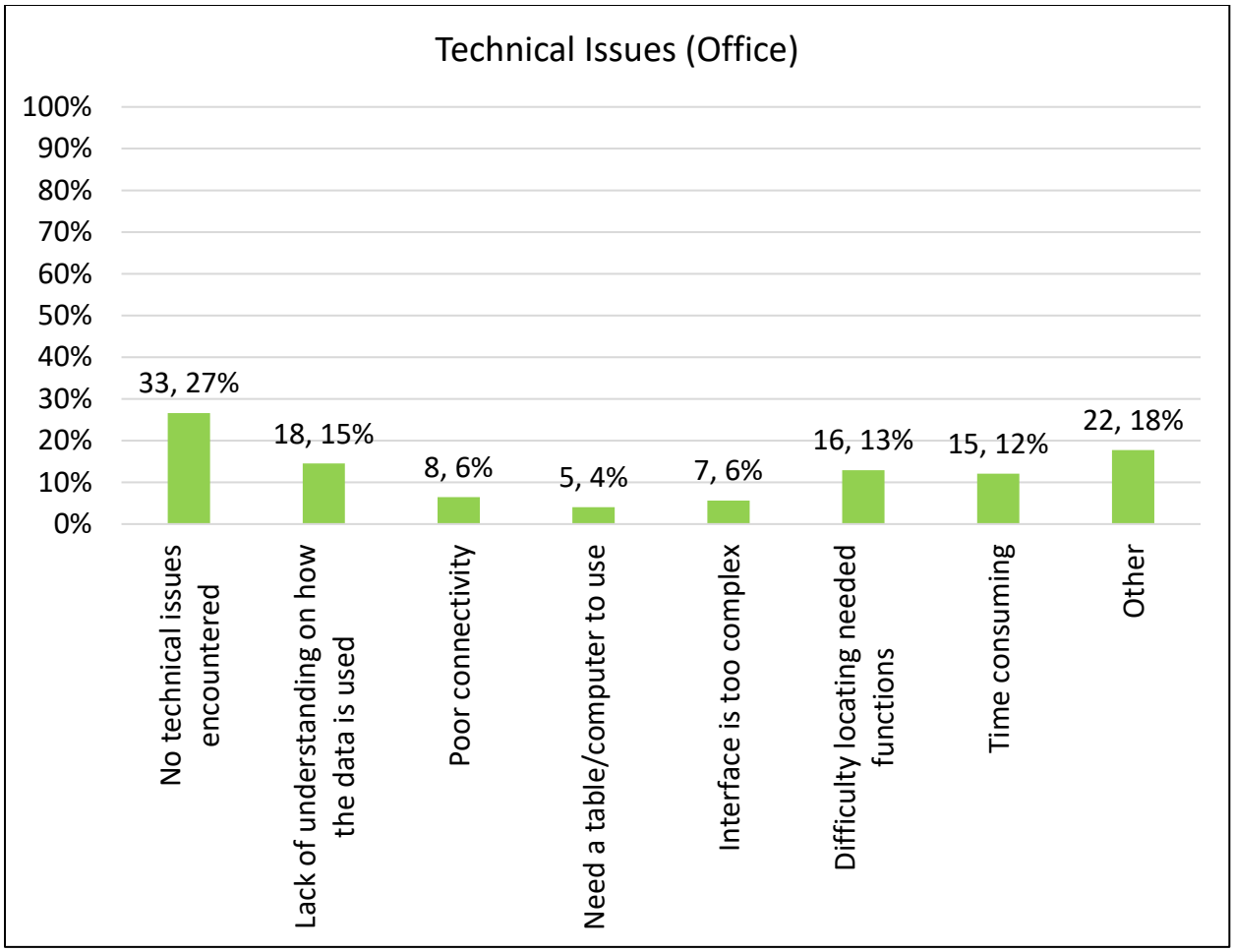


Figure 4.30 Technical Issues Encountered by Office Employees Using the BOOTS System

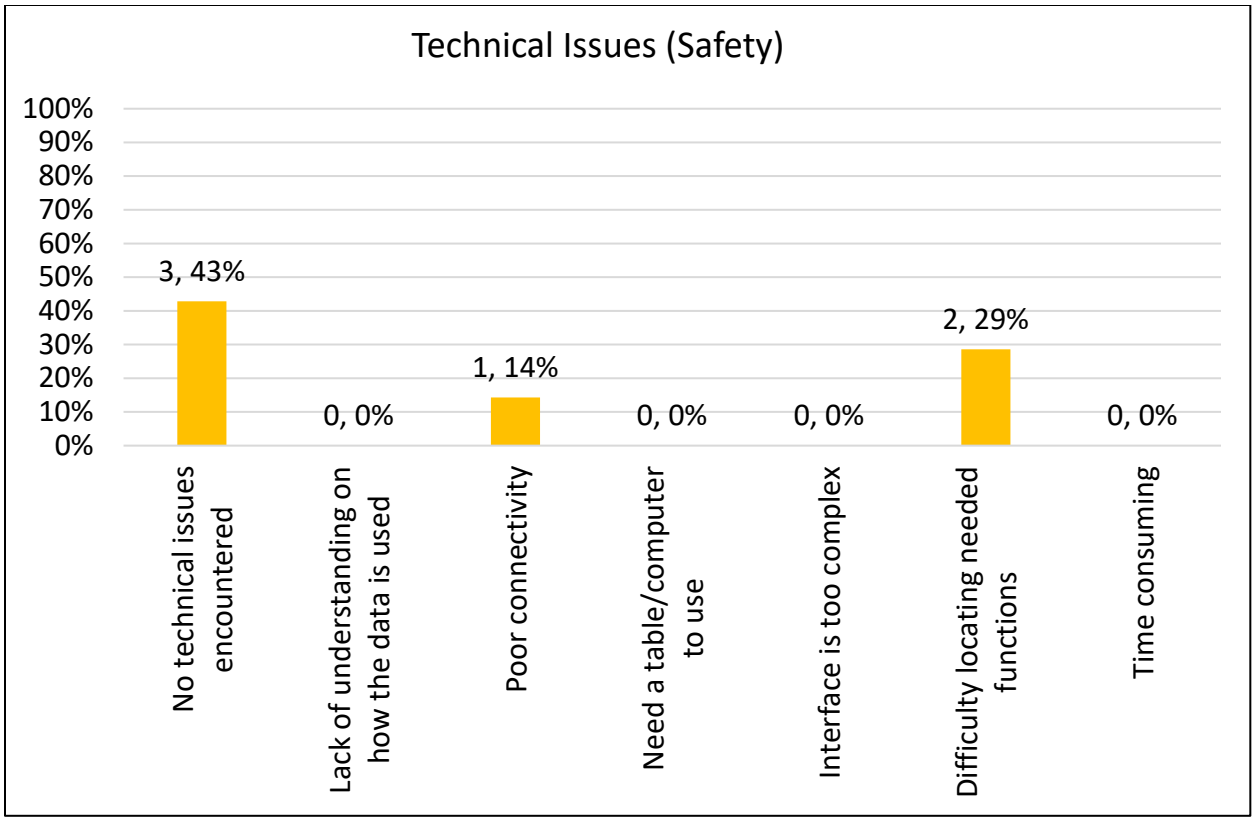


Figure 4.31 Technical Issues Encountered by Safety Division Employees Using the BOOTS System

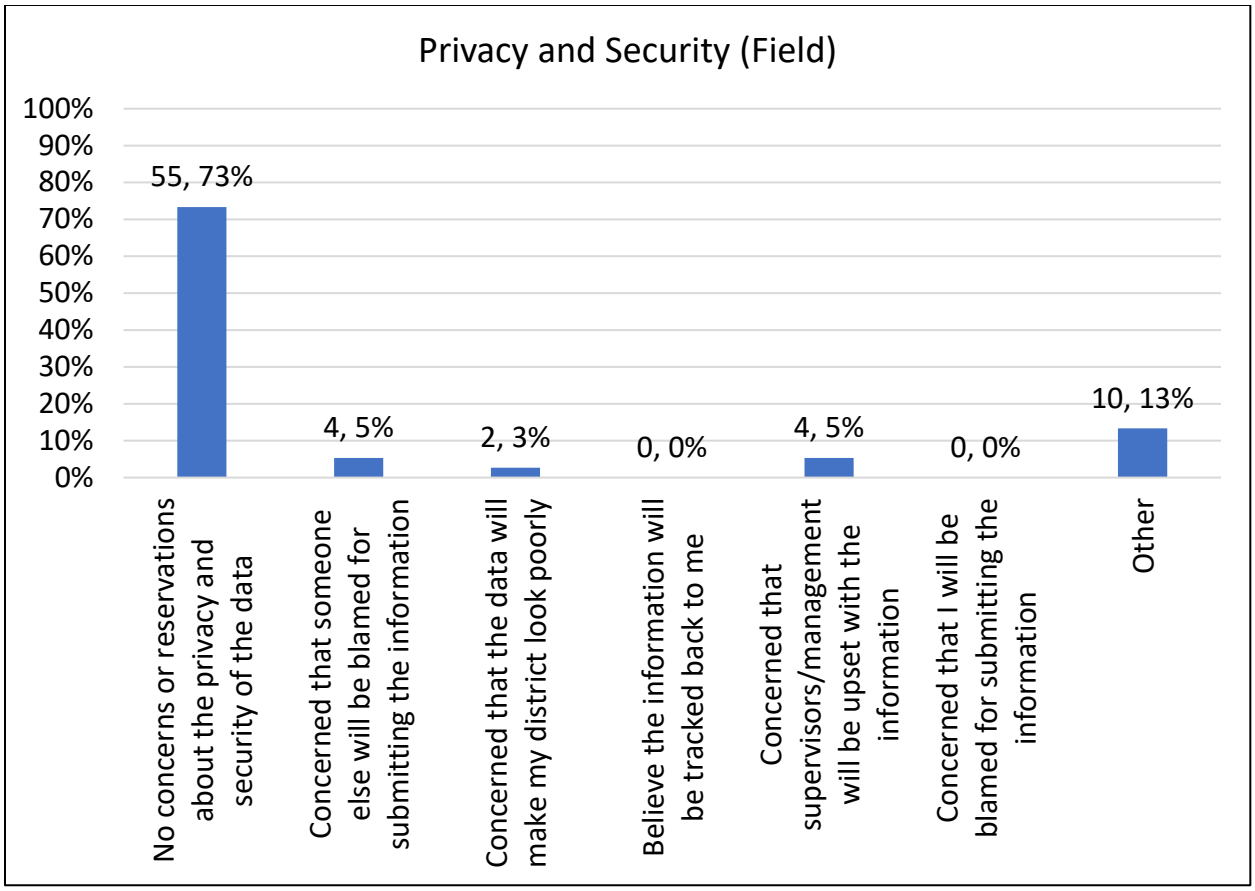


Figure 4.32 Privacy and Security Concerns Among Field Employees

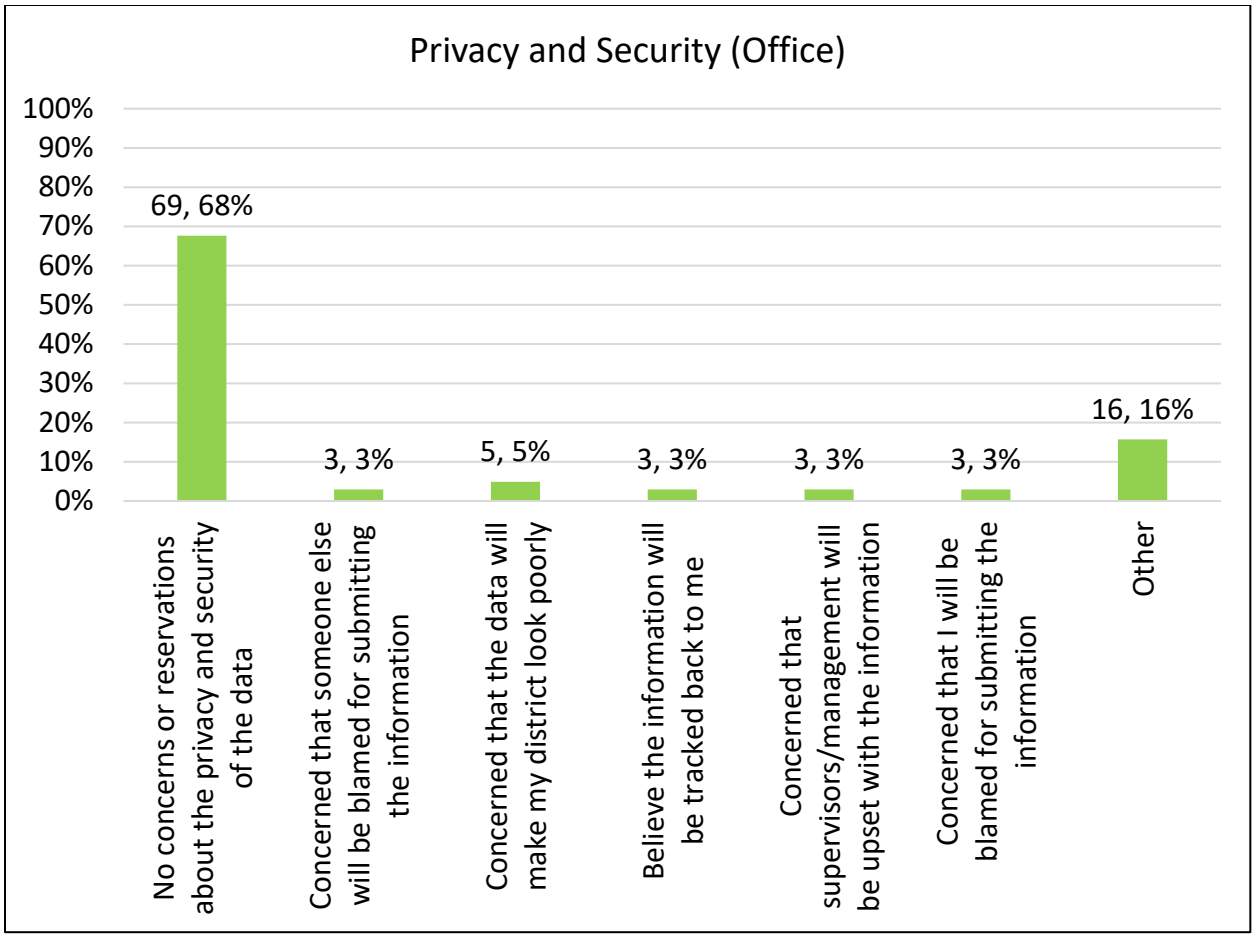


Figure 4.33 Privacy and Security Concerns Among Office Employees

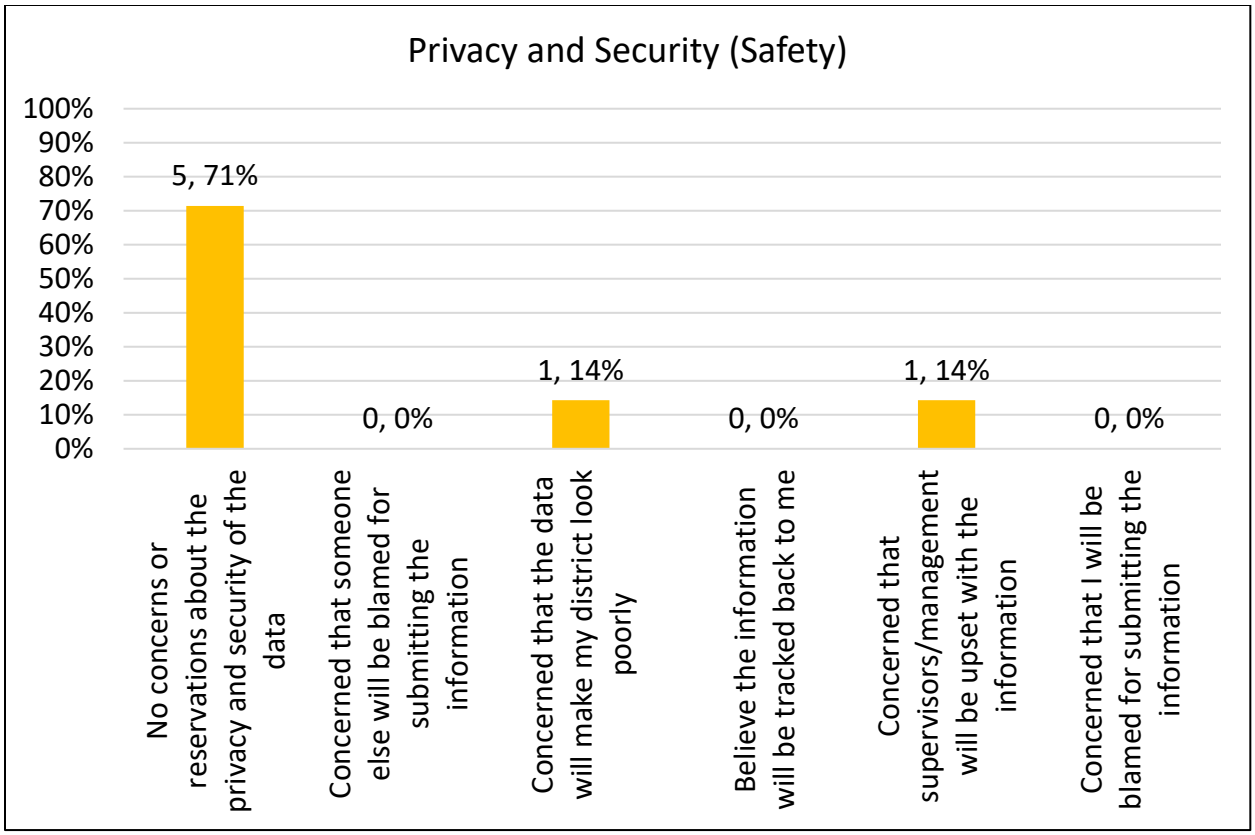


Figure 4.34 Privacy and Security Concerns Among Safety Division Employees

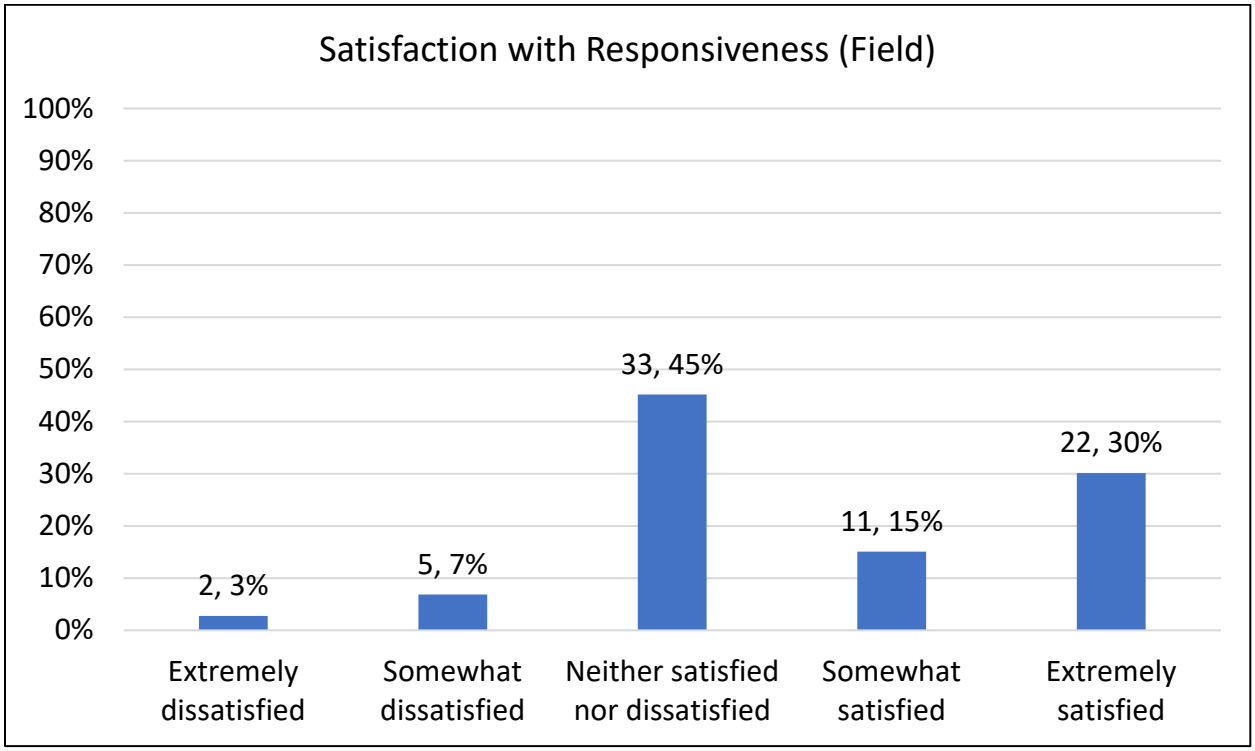


Figure 4.35 Satisfaction with Responsiveness of Support (Field Employees)

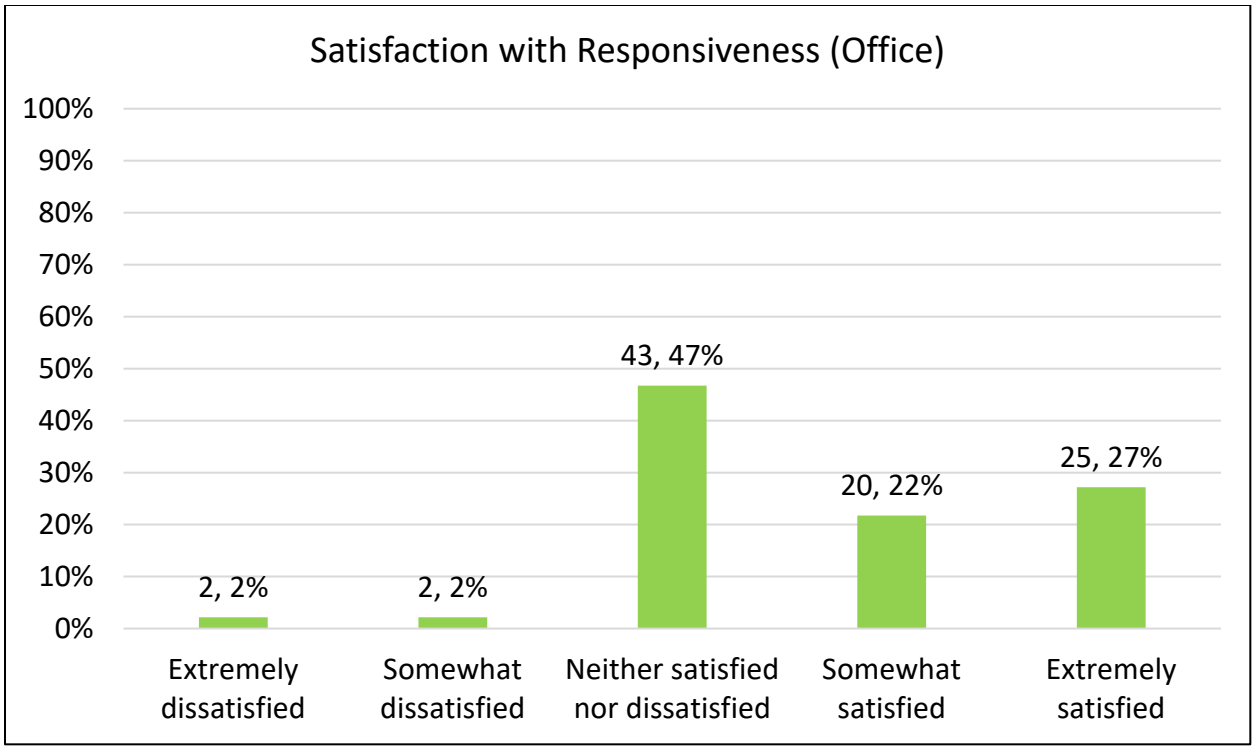


Figure 4.36 Satisfaction with Responsiveness of Support (Office Employees)

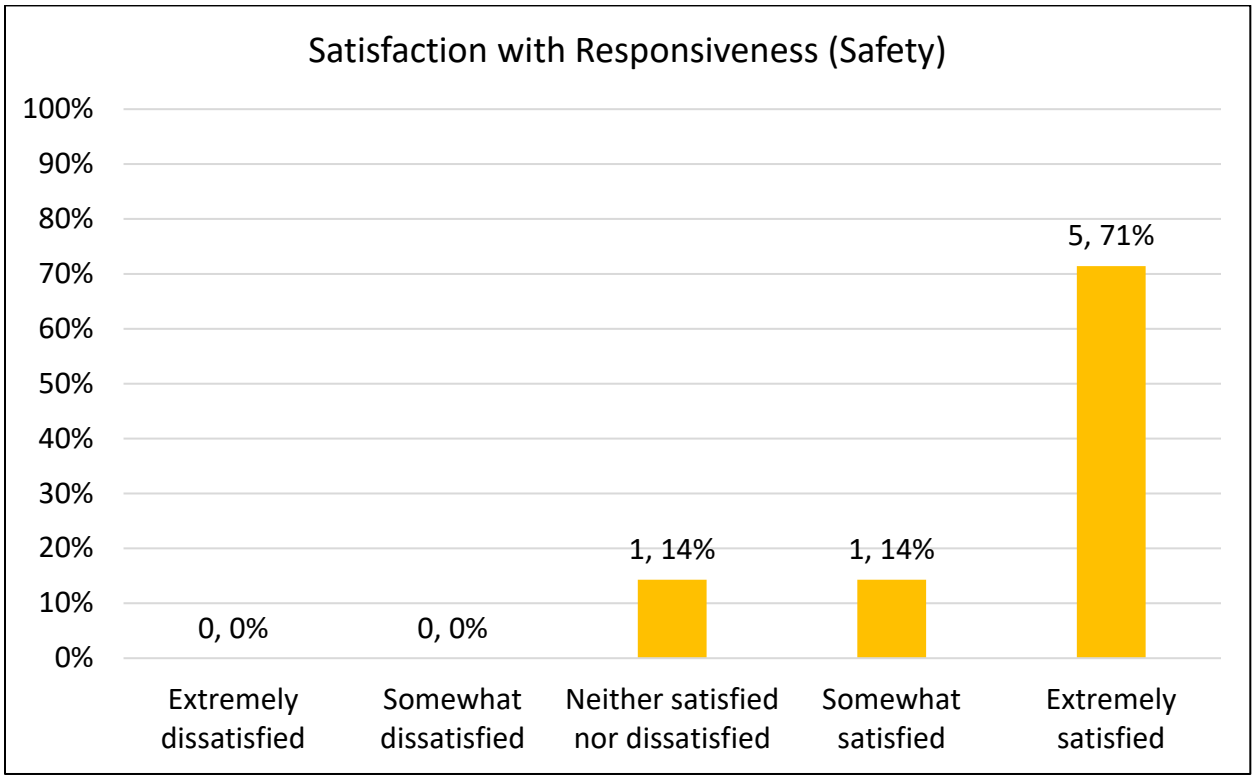


Figure 4.37 Satisfaction with Responsiveness of Support (Safety Division Employees)

4.6.6 BOOTS System Perception

The survey results reveal mixed perceptions regarding the impact of the BOOTS system on safety measures. Among field employees, 14% strongly disagreed, 4% somewhat disagreed, 37% neither agreed nor disagreed, 31% somewhat agreed, and 12% strongly agreed that the system improved safety. Office employees exhibited a similar distribution, with 10% strongly disagreeing, 4% somewhat disagreeing, 37% neither agreeing nor disagreeing, 27% somewhat agreeing, and 19% strongly agreeing. Safety employees, however, had a more positive outlook, with no respondents strongly or somewhat disagreeing, 28% neither agreeing nor disagreeing, 28% somewhat agreeing, and 42% strongly agreeing that the system enhanced safety measures. These responses indicate that while many believe the BOOTS system will improve safety, there remains a significant portion of the workforce that is either neutral or skeptical about its benefits.

The willingness to recommend the BOOTS system varied among different groups. Field employees showed a moderate inclination to recommend the system, with 10% stating they would not recommend it at all, 9% not likely, 35% maybe, 14% very likely, and 29% without reservation. Office employees presented a slightly more reserved stance, with 5% not recommending it at all, 16% not likely, 37% maybe, 19% very likely, and 22% without reservation. In contrast, safety division were more enthusiastic, with no respondents indicating that they would not recommend it, 29% maybe, and 71% recommending it without reservation. These findings suggest that while there is a general willingness to recommend the BOOTS system, particularly among safety workers, reservations among field and office workers need to be addressed.

Regarding the efficiency of safety duties, field employees' responses varied, with 9% stating the BOOTS system made their tasks much less efficient, 10% somewhat less efficient, 32% noticing no change, 34% finding it somewhat more efficient, and 13% much more efficient. Office employees had a similar distribution, with 6% feeling much less efficient, 6% somewhat less efficient, 42% noticing no change, 27% somewhat more efficient, and 20% much more efficient. Safety employees were more positive, with no respondents indicating decreased efficiency, 57% reporting somewhat more efficiency, and 43% much more efficiency. These responses highlight that while the BOOTS system has the potential to improve efficiency in safety duties, its impact is perceived differently across roles, suggesting a need for further optimization.

The perceived value of the BOOTS system in enhancing safety varied among groups. Among field employees, 16% considered it not valuable, 17% slightly valuable, 30% moderately valuable, 26% very valuable, and 9% extremely valuable. Office employees provided similar feedback, with 19% finding it not valuable, 14% slightly valuable, 33% moderately valuable, 21% very valuable, and 20% extremely valuable. Safety employees had the most positive outlook, with no respondents considering it not valuable, 14% slightly valuable, 43% very valuable, and 43% extremely valuable. These responses indicate that while the BOOTS system is seen as beneficial in enhancing safety, its perceived value is higher among safety workers than field and office workers.

Thematic analysis of responses about how BOOTS has impacted safety measures and additional feedback provided key insights. Field employees noted improvements in ease of reporting and the embedding of a safety culture, but also mentioned an increased workload, lack of training, and user interface issues. Office employees appreciated the enhanced reporting and documentation that led to greater awareness and accountability, but they expressed concerns about the system's overall utility and emphasized the need for better training and email notifications. Safety staff highlighted the system's role in streamlining incident investigations and increasing reporting efficiency, enabling them to report issues without fear of retaliation, yet they pointed out distribution challenges. Despite these concerns, there was positive feedback about the software's potential and future improvements. Overall, the

responses indicate that while the BOOTS system has positively influenced safety practices, there is significant room for improvement in training, user interface, and distribution.

BOOTS Improving Safety? — Themes

How has the software improved or not improved safety measures with your KYTC-related activities?

Field

- Mixed views on safety improvement
- Added workload
- Ease of reporting
- Cultural embedment of safety

Office

- Reporting and documentation
- Awareness and accountability
- System utility concerns

Safety

- Streamlined incident investigations
- Increased reporting efficiency
- Empowerment and reporting without retaliation

BOOTS Additional Comments – Themes

Please share any additional comments, suggestions, or concerns you have about the software that were not covered by the previous questions.

Field

- Lack of training
- User interface issues
- Reporting and tracking issues

Office

- Need for training
- Email notification issues
- User interface and functionality improvements
- Positive feedback and future potential

Safety

- Distribution Issues

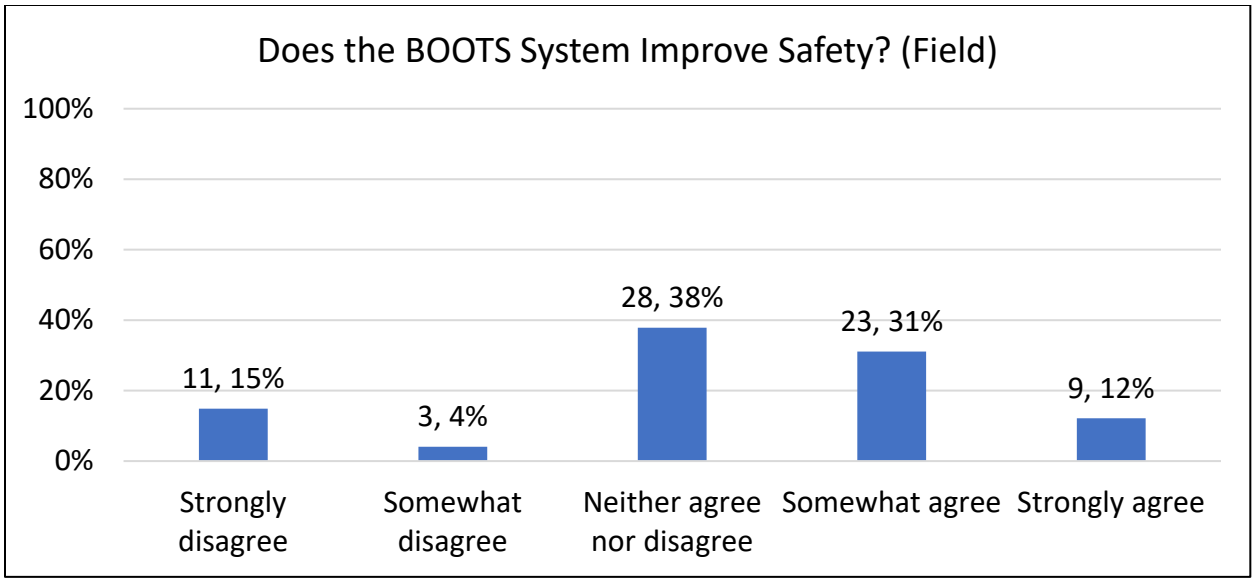


Figure 4.38 Field Employees' Perception of the BOOTS System's Impact on Safety

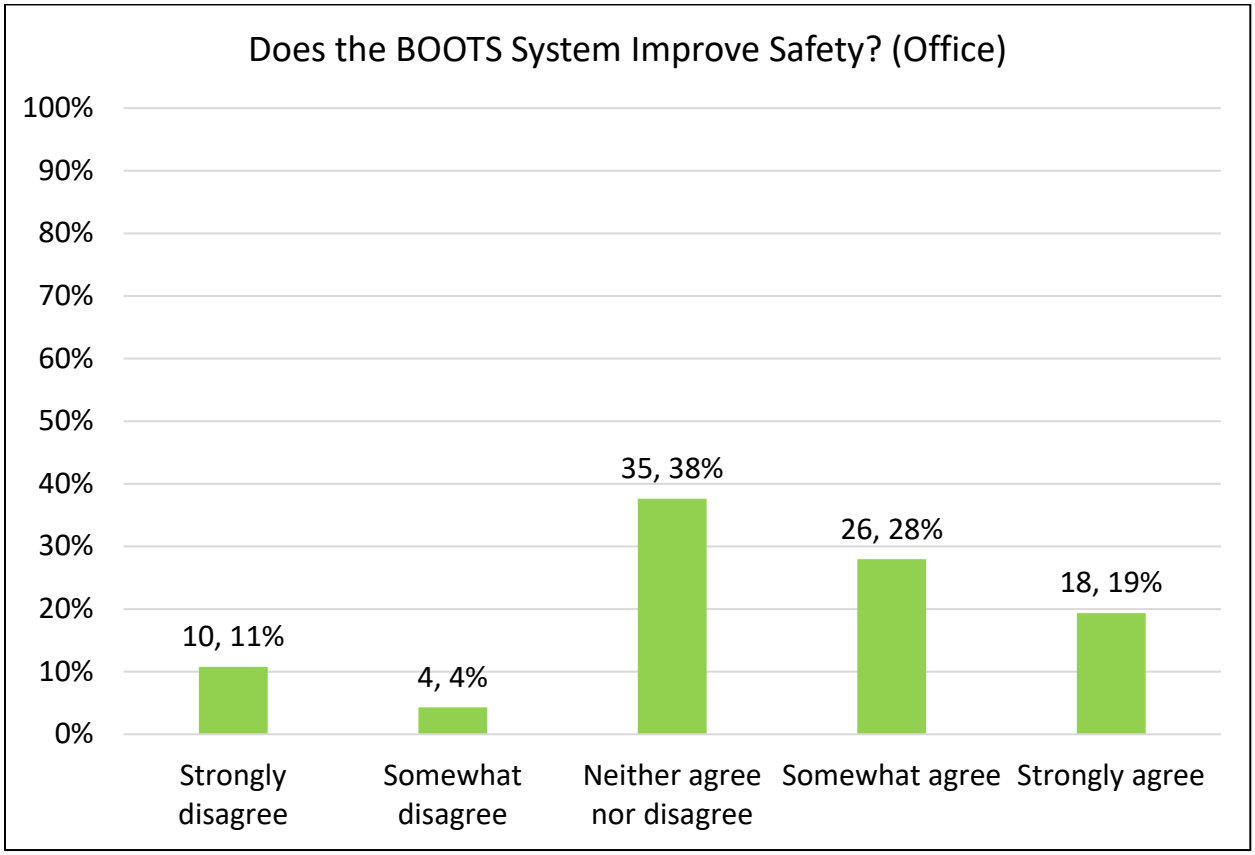


Figure 4.39 Office Employees' Perception of the BOOTS System's Impact on Safety

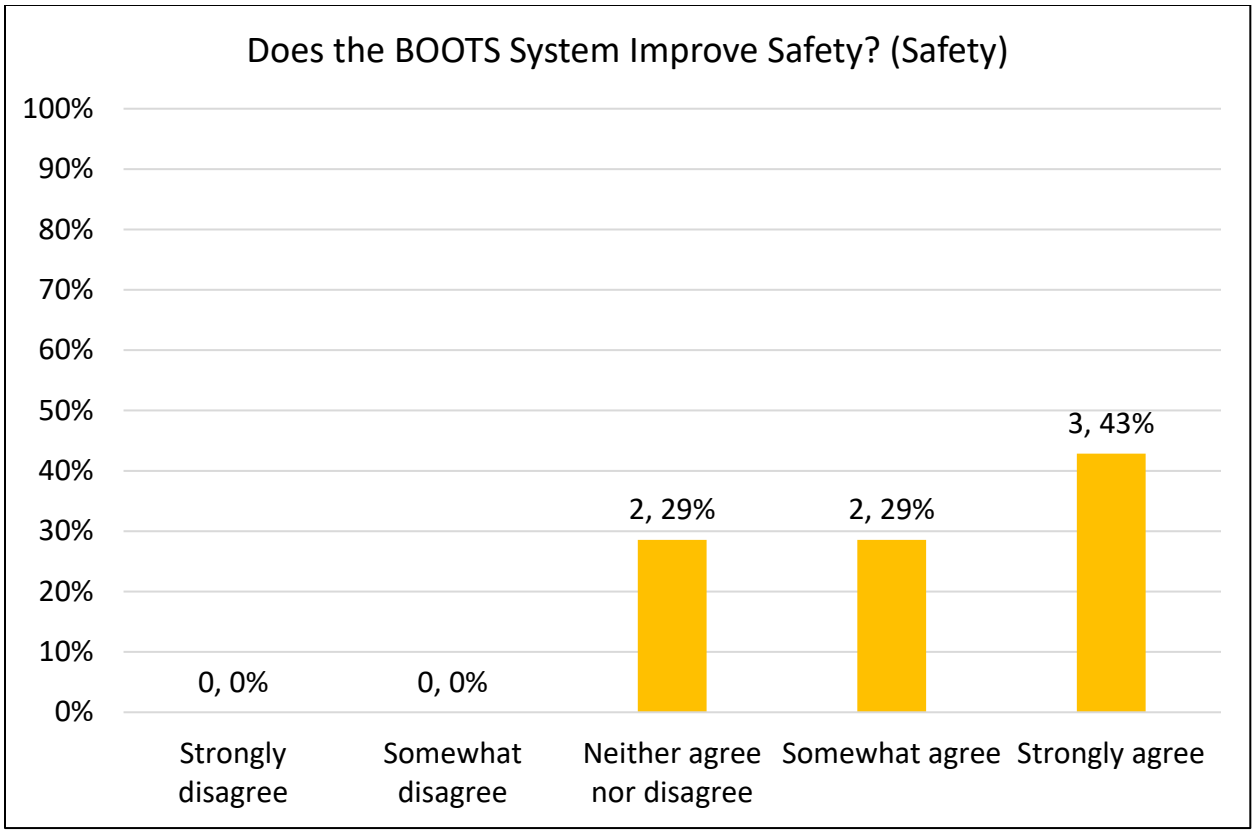


Figure 4.40 Safety Employees' Perception of BOOTS' Impact on Safety

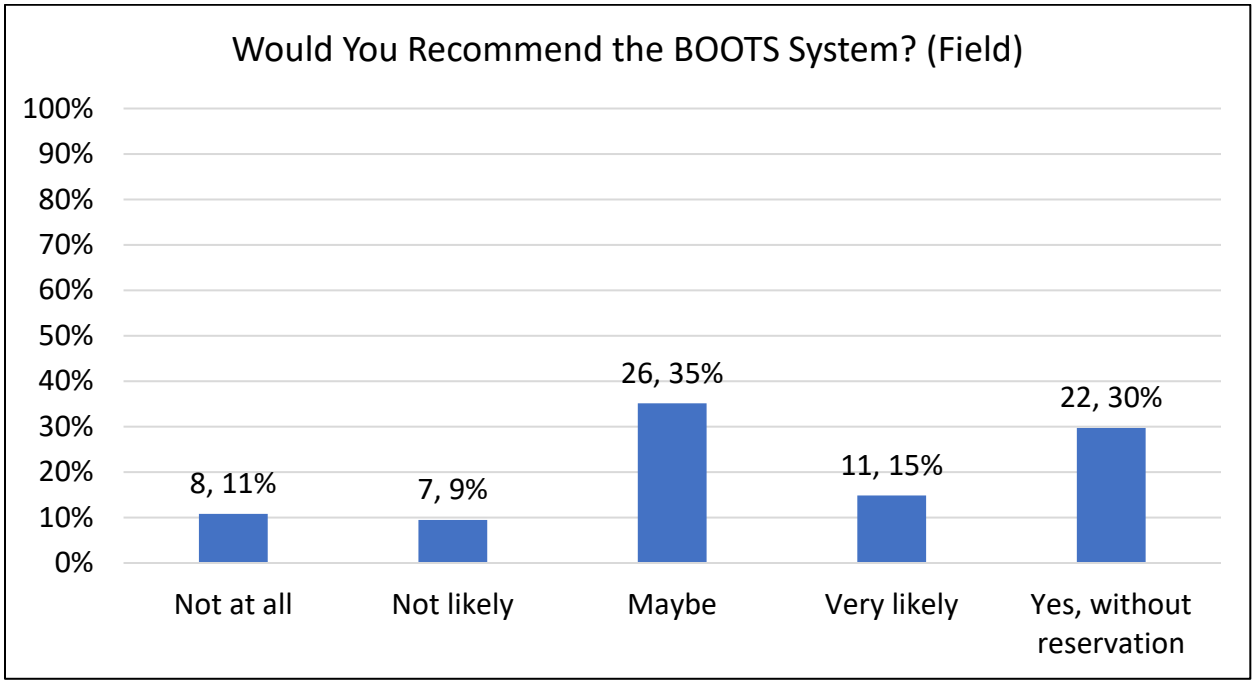


Figure 4.41 Field Employees' Willingness to Recommend the BOOTS System

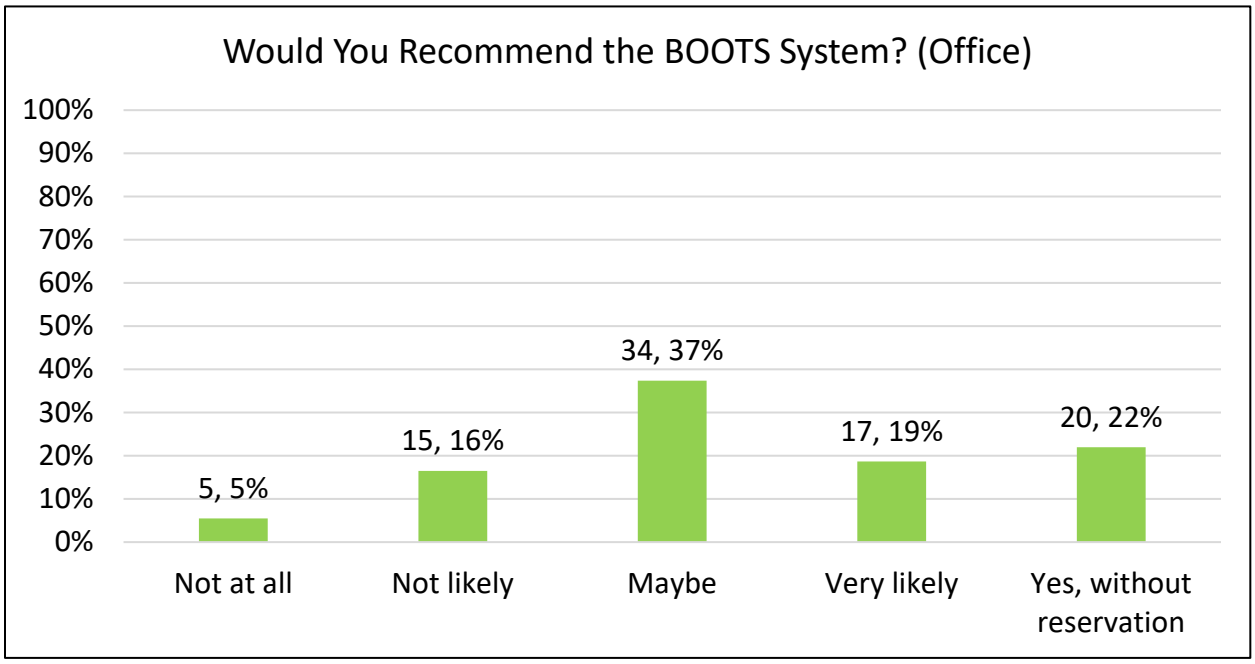


Figure 4.42 Office Employees' Willingness to Recommend the BOOTS System

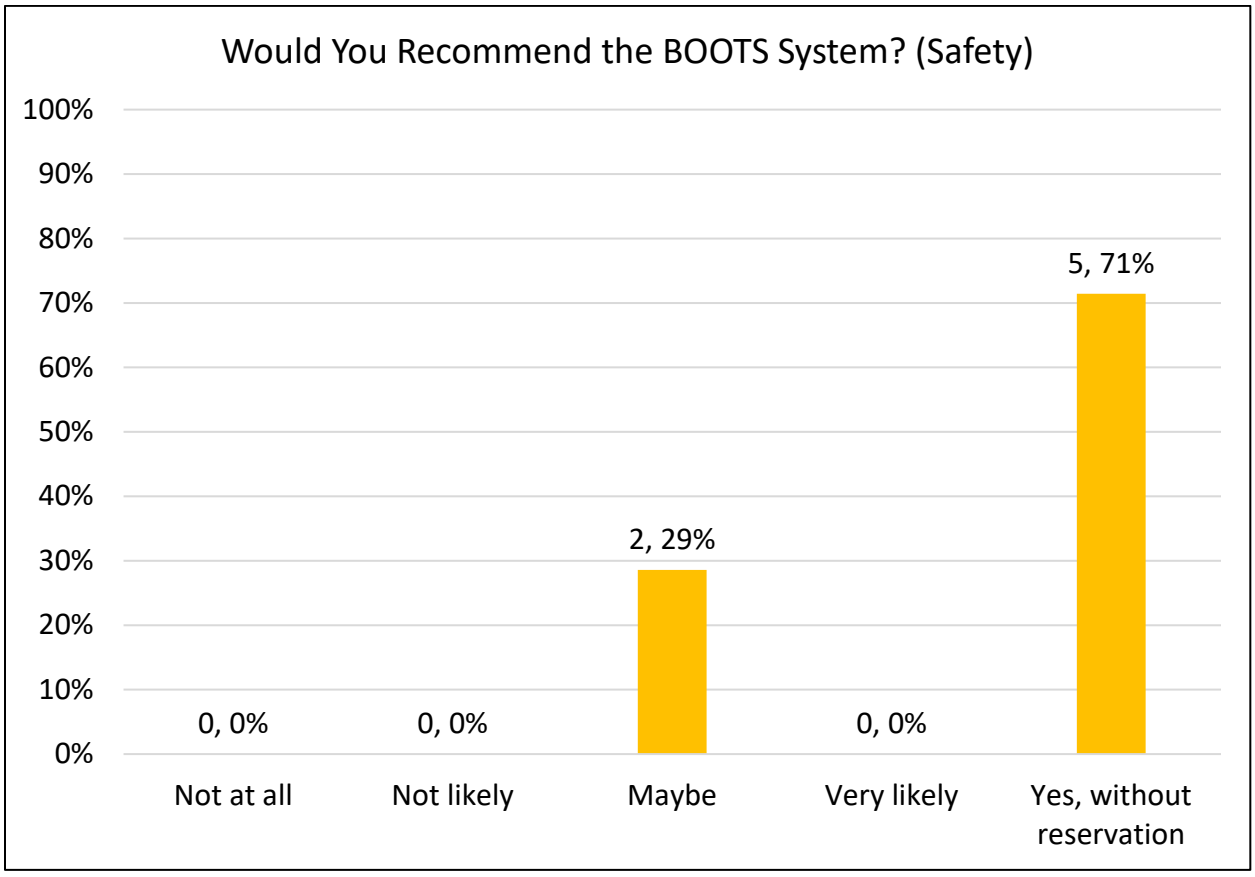


Figure 4.43 Safety Employees' Willingness to Recommend the BOOTS System

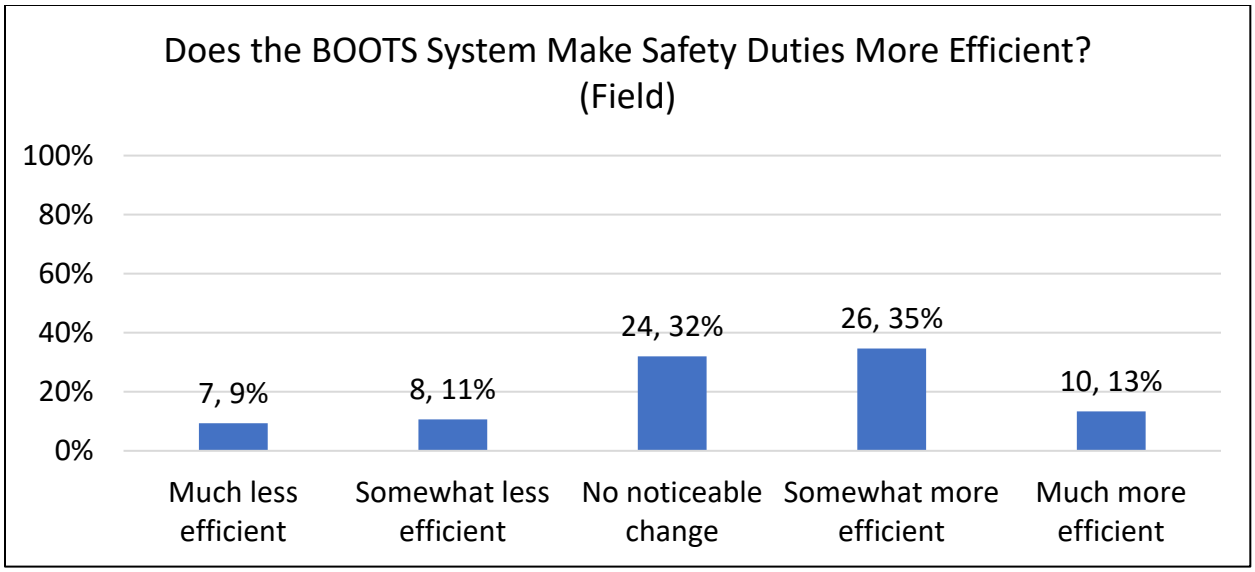


Figure 4.44 Efficiency of Safety Duties with the BOOTS System (Field Employees)

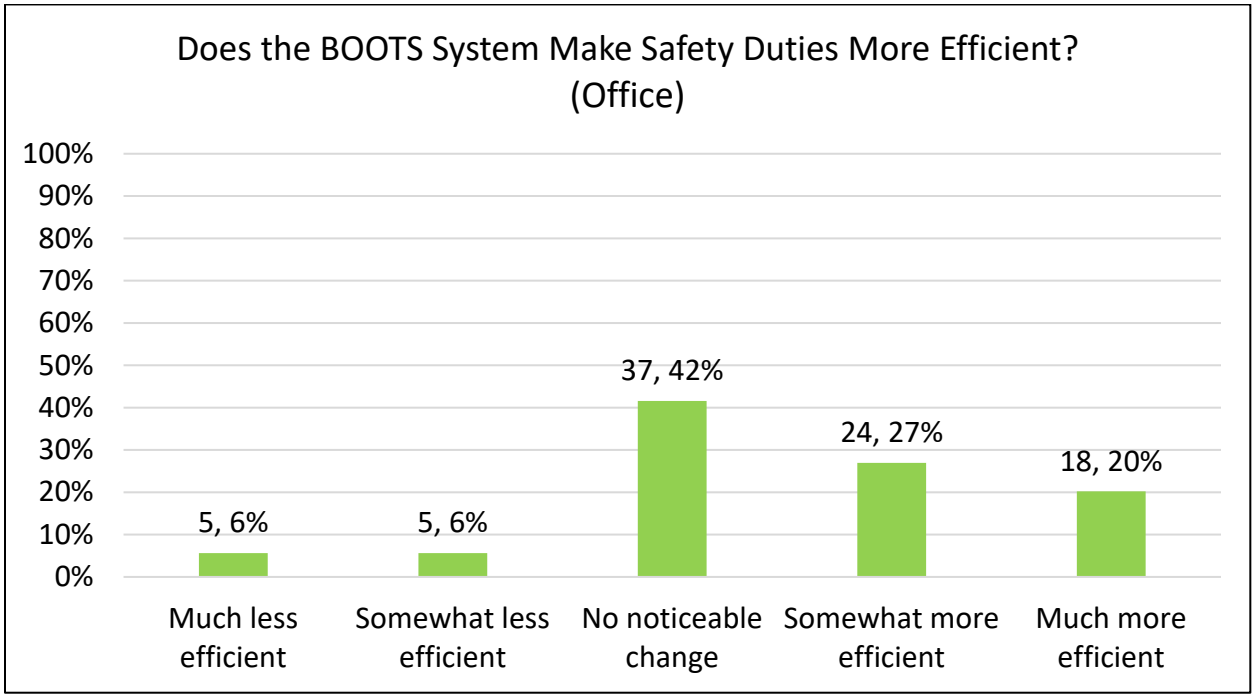


Figure 4.45 Efficiency of Safety Duties with the BOOTS System (Office Employees)

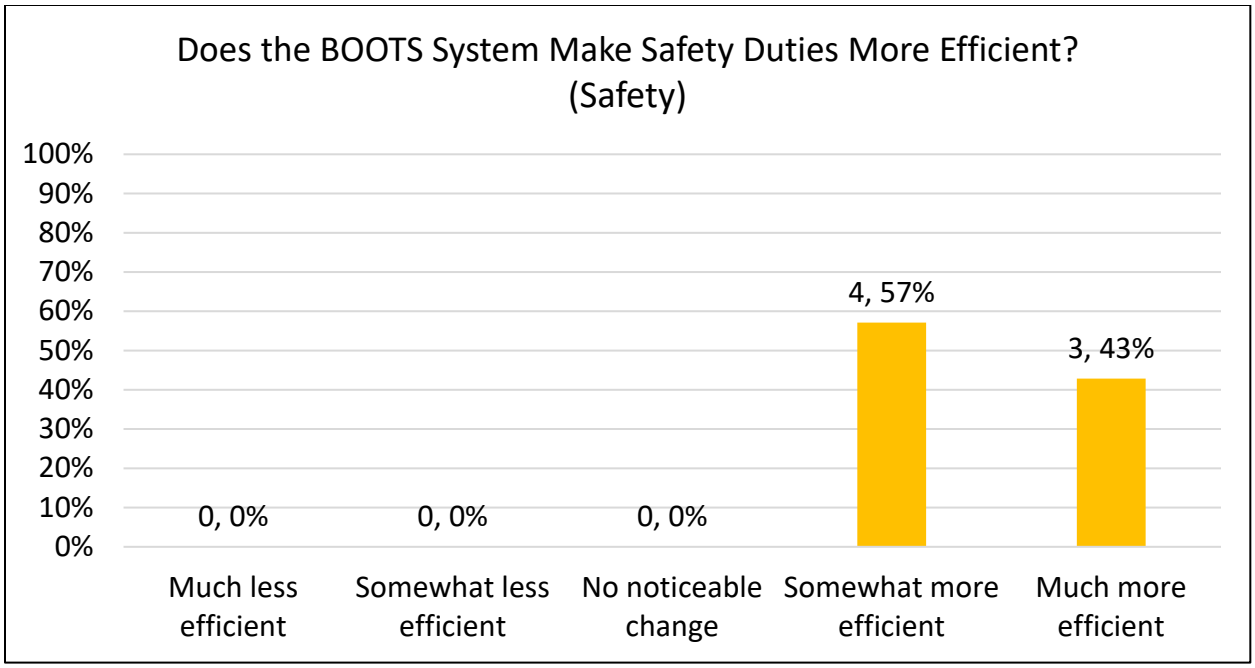


Figure 4.46 Efficiency of Safety Duties with the BOOTS System (Safety Employees)

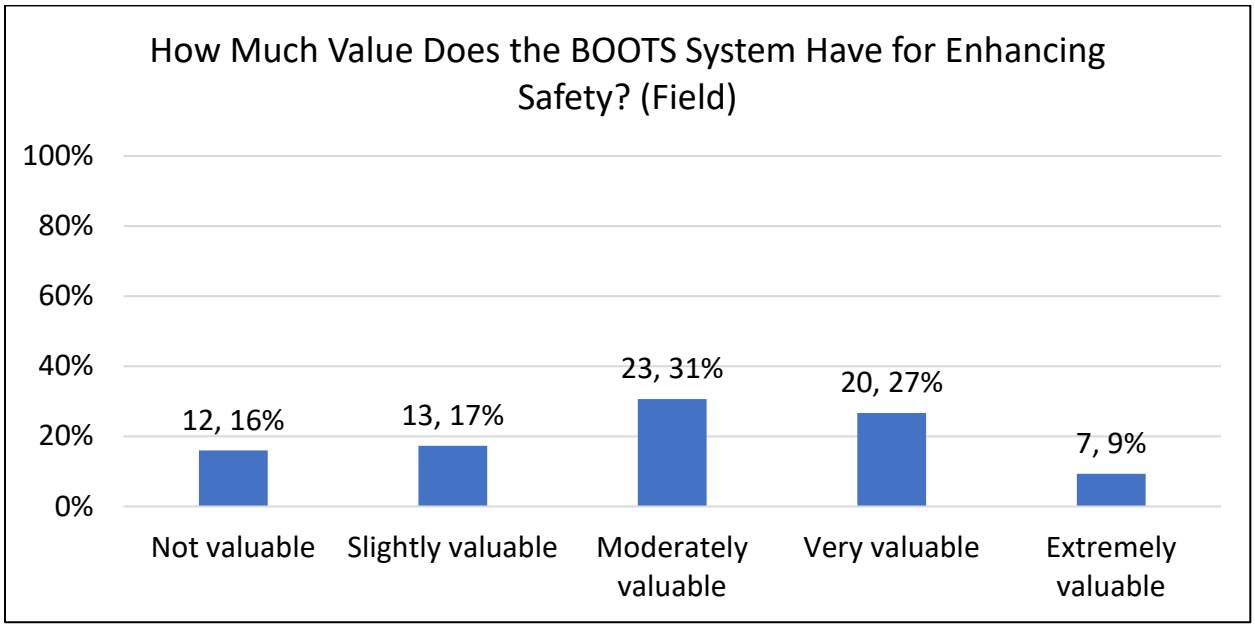


Figure 4.47 Value the BOOTS System for Enhancing Safety (Field Employees)

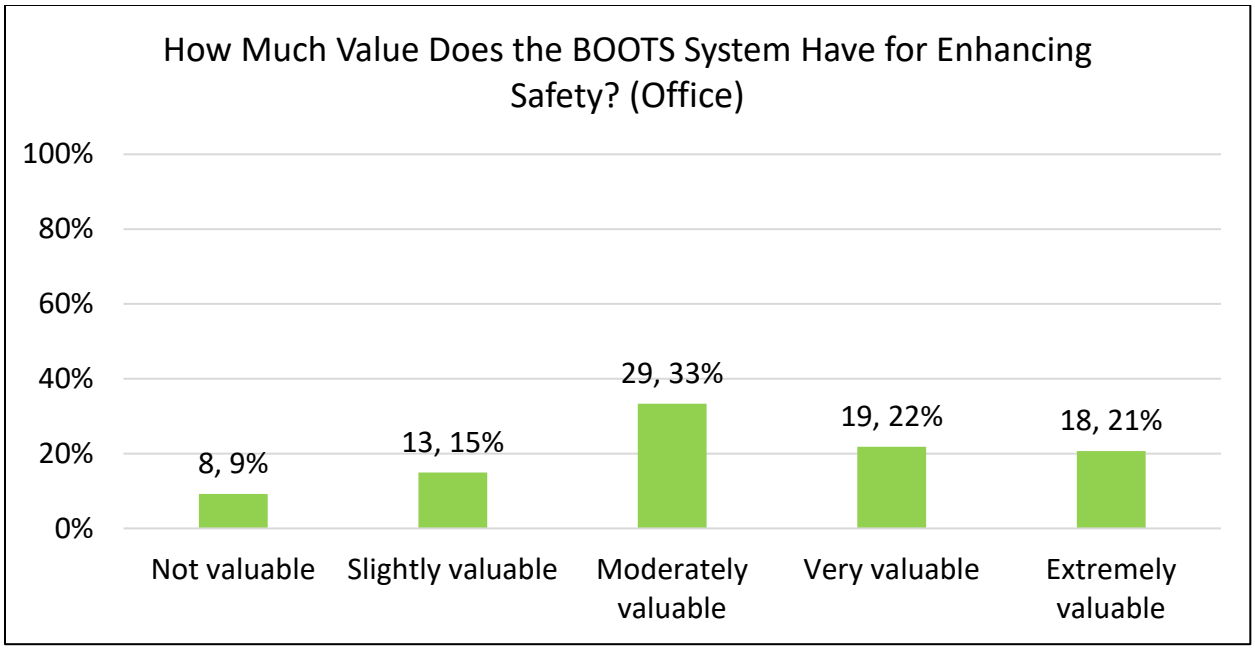


Figure 4.48 Value the BOOTS System for Enhancing Safety (Office Employees)

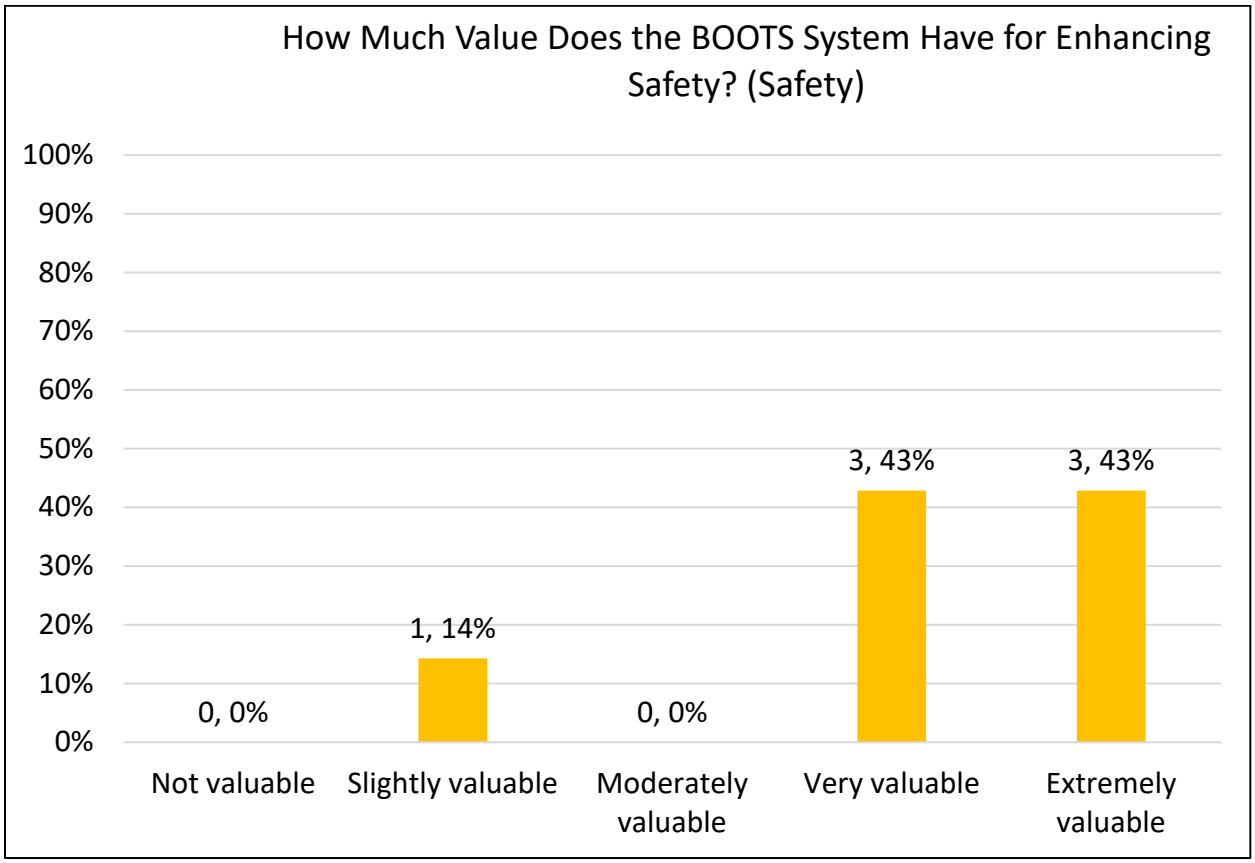


Figure 4.49 Value the BOOTS System for Enhancing Safety (Safety Employees)

Chapter 5 Findings and Analysis

The successful implementation of a technology like the BOOTS system relies on integrating three critical elements: People, Process, and Technology. These elements, often referred to as the PPT model (Figure 5.1), are fundamental for ensuring a system is effectively adopted and utilized, resulting in improved safety outcomes.

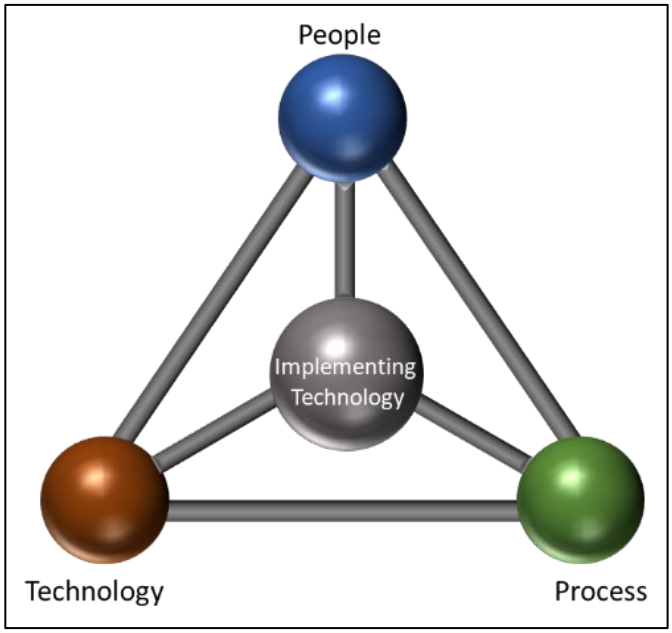


Figure 5.1 People - Process - Technology Implementation Model

5.1 People

The people involved in the implementation and use of the BOOTS system are critical. This includes the end users, but also the administrators and trainers. Effective training programs and continuous support are essential to ensure that employees understand how to use the system and can integrate it into their daily operations. As the report indicates, significant concerns were raised about the adequacy of training, with many employees feeling that they did not receive enough guidance. Addressing these concerns by providing comprehensive training materials, including narrated videos and user manuals, is vital for the successful adoption of the system.

5.2 Process

The processes associated with BOOTS must be clearly defined and streamlined. This includes steps for reporting incidents, managing safety data, and conducting safety audits. The report highlights several logistical concerns, such as the need for more iPads for field reporting and the ability to edit and complete reports collaboratively. Ensuring that these processes are efficient and user friendly will help minimize resistance to the new system and maximize its effectiveness. Additionally, addressing issues like verifying signatures for attendance, customizing notifications for various safety checks, and limiting the amount of personally identifying information that can be seen by other employees is important.

5.3 Technology

The technology behind BOOTS, particularly the software and its capabilities, is the backbone of the system. The report identifies several technical challenges, including issues with system performance, user interface, and data security. It is essential to address these challenges through continuous improvements and software updates. The

customization of the BOOTS software to meet KYTC's specific needs, such as providing a digital platform for instant data storage and analysis, has already conferred significant benefits in reporting and managing safety incidents.

Organizational change is difficult. It requires work behind the scenes to prepare the employees. This is something KYTC knew when it decided to implement BOOTS. The investment in an SMS was an opportunity to create a safer work environment through data-driven processes.

Analysis of incident claims, safety opportunity reports, and worker compensation for the months of September 2022 and September 2023 revealed a 5x year-over-year increase in incident claims. The research team predicts that there were not more employees getting hurt in September 2023. There were just more injuries reported in September 2023 than in September 2022. The BOOTS system gave employees a convenient way to report an incident. The SMS also provided KYTC with a database for private property damage and state vehicle and equipment damage data. The amount of safety opportunity reports remains constant due to the recent transition away from a paper-based process. The change from a website to an SMS submission of the SORs did not discourage employees.

A brief analysis of worker compensation claims was done to review the amount of compensation and number of claims filed. Analysis was limited due to a lack of personnel data. A part of the worker compensation analysis was an analysis of the 32 employee involved. KYTC explained its needs to protect employee privacy, but this was an obstacle in data analysis. Without knowledge of the employee's personnel file like relationship status, number of dependents, hire date, education, and part-time or full-time status, no conclusions could have been made in connection.

Due to the nature of the BOOTS system, a predefined workflow for the incident and worker compensation investigations had to be adapted. Another limitation was the missing link from an incident claim to a worker compensation claim. Their predefined workflow was shifted and in early data analysis, this limited the review because the research team lacked information. The research team would either find the incident claim where an employee was injured but no worker compensation claim was electronically linked or vice versa. Eventually, it was determined the information was manually inserted to link the two claims. Once this is explored, conclusions can be drawn from the data. Future work on this topic can include an annual review to highlight possible benefits and limitations of an SMS in a public agency. A review could identify district performance and reporting consistency. A benefit assessment can show a return on investment or quantify changes in work safety conditions. A review could also provide KYTC with limitations that can become new objectives for maintaining a digital comprehensive SMS. Also, an additional focus group or satisfaction survey needs to be done to determine if everyone's expectations were met and to encourage continuous support in the system.

The KYTC employees employee survey provided comprehensive insights into how the BOOTS system is used, training effectiveness, functionality, and overall perception. The survey revealed that while the system has potential benefits, significant areas for improvement remain. Training and resource allocation are key areas needing enhancement, with around half of the respondents reporting they did not receive adequate training. The adequacy of training was also mixed, indicating that while many found it sufficient, many felt it was only somewhat helpful or insufficient. This highlights the need for more comprehensive and effective training programs to ensure all users are well-equipped to utilize the system.

Functionality analysis showed that submitting safety incident reports and tracking related data are the most valued features among both field and office employees. These functionalities are crucial for improving safety oversight and management within KYTC. However, users faced challenges with tracking safety reports and submitting related claims, suggesting a need for system enhancements to simplify these processes and improve the user interface. The

thematic analysis highlighted critical areas for improvement, such as process efficiency, privacy concerns, and the need for better training and support.

Technical issues were prevalent among both field and office workers, with field workers reporting access problems, poor system performance, and difficulties with photo/image uploads. Office workers experienced challenges with the initial setup, communication issues, and duplicate information. Privacy and security concerns were significant, with worries about the exposure of personal information and the visibility of employee data within the system. These findings underscore the importance of implementing robust security measures and improving communication about data protection practices to build user trust and enhance the overall functionality of the BOOTS system.

The overall perception of the BOOTS system varied among employee groups. While safety workers had a more positive outlook, field and office workers expressed mixed views on the system's impact on safety and its utility. Although there was a general willingness to recommend the BOOTS system, especially among safety workers, field and office workers expressed reservations that should be addressed. The survey responses indicated that while the BOOTS system has positively influenced safety practices, further improvements in training, user interface, and system functionality are essential to enhance its effectiveness and user satisfaction. Addressing these challenges will ensure that the system continues to meet the evolving needs of KYTC employees and contributes to a safer and more efficient work environment.

5.4 Future Directions

Future work should focus on addressing the identified challenges and enhancing the BOOTS system to better meet user needs. This includes developing more comprehensive training programs and ensuring consistent resource allocation to all employees. System enhancements should aim to simplify the user interface, streamline processes for tracking and reporting safety incidents, and improve overall system performance. Additionally, robust security measures must be implemented to address privacy concerns, alongside clear communication about data protection practices. Further research could also explore the long-term impact of these improvements on safety outcomes and user satisfaction.

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Appendix A – Pre-Rollout Focus Group Presentation

Introducing

Safety Management System

TEAM KENTUCKY TRANSPORTATION CABINET

KTC

1

Today's Agenda

- Introductions (5 minutes)
- Introduction of the Safety Management System (15 minutes)
- Questions (5 minutes)
- Feedback on anticipated use (25 minutes)
- Feedback on branding (5 minutes)
- Closing and timeline (5 minutes)

2

Introductions

- Name
- Position

3

Introduction of the Safety Management System

TEAM KENTUCKY TRANSPORTATION CABINET

KTC

4

Our Solution: SMS

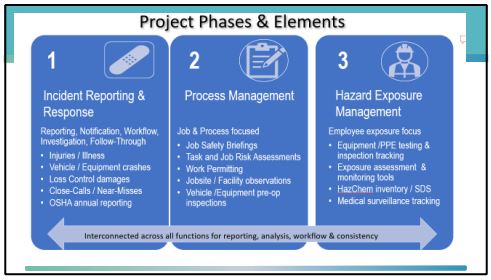
- Web based Safety Management System
- Accessible via Mobile Phone, Tablet or PC
- Effective sharing of information and tasks
- Single source for common safety resources, tasks, and data
- Capture photos and videos on the fly right from mobile app to add clarity
- Easy sign in with no login or passwords to remember
- All data is stored in one place.

6

What can it do?

Empower employees across KYTC to easily and efficiently report injuries, illnesses, vehicle and property damage, and safety issues.	Ease burden of routine safety tasks such as jobsite, facility and equipment checks	Provide information needed to learn from incidents and close calls
Eliminate paper and outdated processes to drive efficiency	Provides tools for supervisors and their teams to positively impact their own safety and health .	Drives a proactive safety culture by identifying workplace hazards and reducing exposures

7


Project Phases & Elements
1
Incident Reporting & Response
Reporting, Notification, Workflow, Investigation, Follow-Through
• Injuries / Illness
• Vehicle / Equipment crashes
• Loss Control damages
• Close-Calls / Near-Misses
• OSHA annual reporting
2
Process Management
Job & Process focused
• Job Safety Briefings
• Task and Job Risk Assessments
• Work Permitting
• Jobsite / Facility observations
• Vehicle /Equipment pre-op inspections
3
Hazard Exposure Management
Employee exposure focus
• Equipment /PPE testing & inspection tracking
• Exposure assessment & monitoring tools
• HazChem inventory / SDS
• Medical surveillance tracking
Interconnected across all functions for reporting, analysis, workflow & consistency

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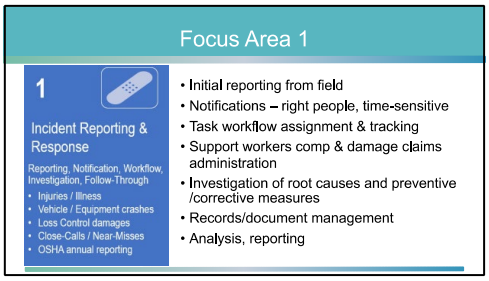
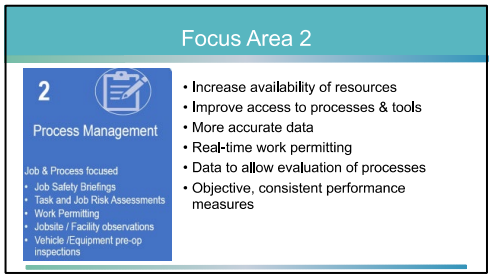
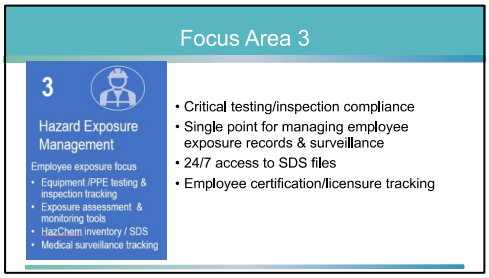

Focus Area 1
1
Incident Reporting & Response
Reporting, Notification, Workflow, Investigation, Follow-Through
• Injuries / Illness
• Vehicle / Equipment crashes
• Loss Control damages
• Close-Calls / Near-Misses
• OSHA annual reporting
• Initial reporting from field
• Notifications – right people, time-sensitive
• Task workflow assignment & tracking
• Support workers comp & damage claims administration
• Investigation of root causes and preventive /corrective measures
• Records/document management
• Analysis, reporting

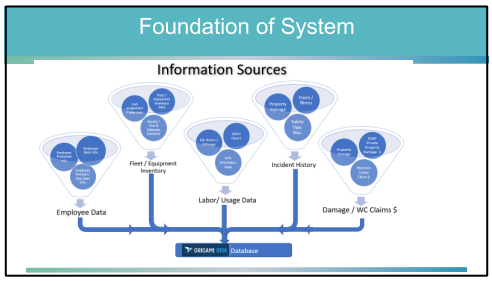
9


Focus Area 2
2
Process Management
Job & Process focused
• Job Safety Briefings
• Task and Job Risk Assessments
• Work Permitting
• Jobsite / Facility observations
• Vehicle /Equipment pre-op inspections
• Increase availability of resources
• Improve access to processes & tools
• More accurate data
• Real-time work permitting
• Data to allow evaluation of processes
• Objective, consistent performance measures

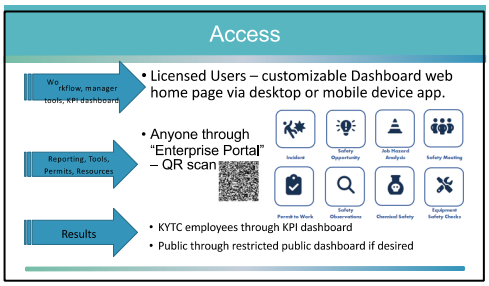
10


Focus Area 3
3
Hazard Exposure Management
Employee exposure focus
• Equipment /PPE testing & inspection tracking
• Exposure assessment & monitoring tools
• HazChem inventory / SDS
• Medical surveillance tracking
• Critical testing/inspection compliance
• Single point for managing employee exposure records & surveillance
• 24/7 access to SDS files
• Employee certification/licensure tracking

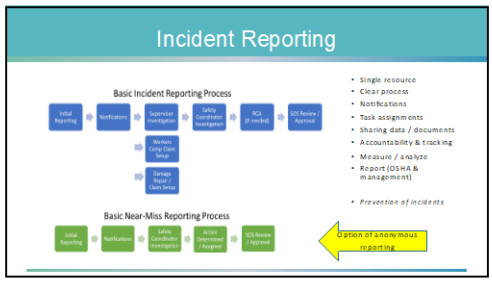
11


Foundation of System
Information Sources
Fleet / Equipment Inventory
Incident History
Employee Data
Labor/ Usage Data
Damage / WC Claims $
Database

12


Access
• Licensed Users – customizable Dashboard web home page via desktop or mobile device app.
• Anyone through "Enterprise Portal" – QR scan
Reporting, Tools, Permits, Resources
Results
• KYTC employees through KPI dashboard
• Public through restricted public dashboard if desired

13



14

Capability	System Admin.	Workers Comp Coord. District Safety	SOS Exec., Dir, Safety Admin.	Legal, State Risk, Division of Equipment	Managers	Non-Licensed Enterprise Portal User
mapping, user security, reports, incidents, tasks forms	Yes	No	No	No	No	No
SSO accessible with configurable Origami Ioms screen	Yes	Yes	Yes	Yes	Yes	No
Can be assigned actions within an existing record	Yes, in task list	Intasc list	in task ist	in task list	Intasc list	Br "Grant Access" link-specific record and time rame
Create "Grant access" [illegible] records	Yes	Yes	Yes	Yes	Yes	No
Assign/monitor task completion or status	Yes, in task system	Yes, in task system	Yes, in task system	Yes, Intasc system	Yes, in task system	Not real time; Can be notified of status
Obtain reports 1: Can configure new 2: Can edit existing 3. Can execute pre-built	1,2,3	3, and receive reports specific to their role or organizational unit	3, and receive reports specific to their role or organizational unit	3, and receive reports specific to their role or organizational unit	3, and receive reports specific to their role or organizational unit	Receive reports through email as attached file
Initiate new records	Yes	Yes	Yes	Yes	Yes	Yes, To defined types through Enteprise-Wide Portal
Access Existing records	On-demand, subject to restrictions	On-demand, subject to restrictions	On-demand, subject to restrictions	On-demand, subject to restrictions	On-demand, subject to restrictions	Specific access for defined time through "Grant Access" link
Location/Cost Center restriction	Correct	None; all KYTC	None; all KYTC	None; all KYTC	Manage/coost centers	None

16

Specific Data Type Access	System Admin.	Workers Comp Coord. District Safety	SOS Exec. Dir, Safety Admin.	Legal, State Risk, Division of Equipment	Managers	Non-Licensed Enterprise Portal User
Employee Data - Basic	Full	Edit	Edit	View	View	None
Employee data - sensitive / protected	Full	Edit	Edit	None	None	None
Employee incident days away, restricted, transferred	Full	Edit	Edit	View	View	None
Incident employee medical treatment	Full	Edit	Edit	View	View	None
Incident workers comp financials	Full	View	View	View	View	None
Safety / RCA investigation reports	Full	Edit	Edit	View	View	None
Supervisor investigation tool	Full	View	View	View	Edit	None
Incident (injury or prop damage) claim / matter #, recovery $, claim $, status updates	Full	View	View	Edit	View	None

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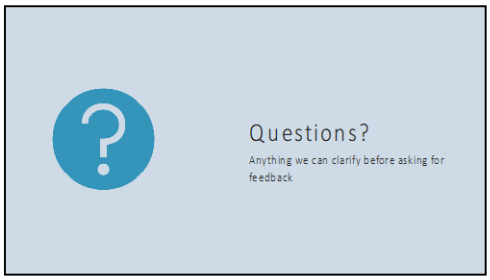

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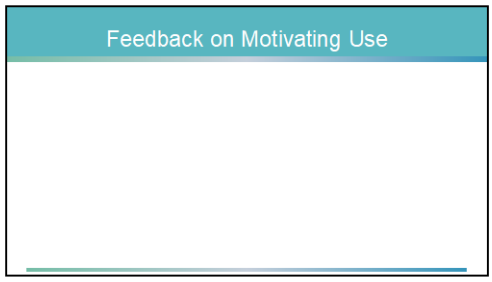

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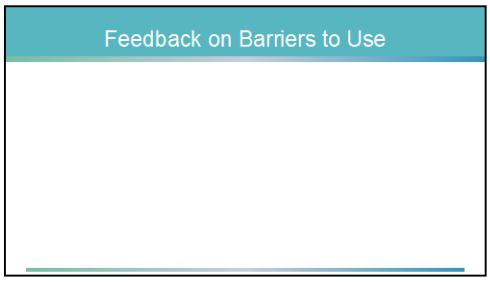

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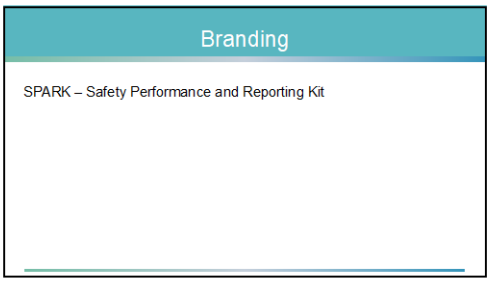
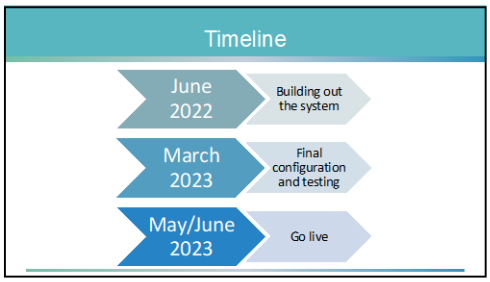

Branding
SPARK – Safety Performance and Reporting Kit

22


Timeline
June 2022
Building out the system
March 2023
Final configuration and testing
May/June 2023
Go live

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Anything else you'd like KYTC to know?
gabe.dadi@uky.edu; 859-257-5416

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Appendix B – Pre-Rollout Focus Group Minutes

Kentucky Transportation Center

176 Raymond Building, University of Kentucky 859.257.4513 www.ktc.uky.edu

Safety Management System Focus Group

District 5

Potential Dates: Friday March 17th
Time: 10am-11am
Location: 8310 Westport Rd.
Louisville, KY 40242

Goal: Introduce district employees to the new safety management system, gather feedback, and discuss branding

Attendees: 12-15 crew, supers, TES, DSC, and CDE

Minutes:

Introductions (5 minutes)

Introduction of the Safety Management System (15 minutes)

Questions (5 minutes)

Feedback on anticipated use (25 minutes)

- HT employee: Would they need to fill out the workers comp claim and print and bring to doctor's office? DSC reminded employee that only claim number is needed, don't need the form.
- **Would benefit greatly from a clear definition of a near miss and examples of boundaries (i.e. what is a near miss? What is NOT a near miss)**
- **Would like to have the QR code or access to the system readily available. Suggested having cards with QR code like the Safety Opportunity Reporting Tool. Noted having links on intranet site and can save link once accessed from the QR code**
- **Noted concerns with connectivity. What tasks can be done offline? What tasks need a connection to be done? Significant concerns voiced with wifi strength in maintenance barns.**
- Liked the idea of automatic push notifications in workflows

ADVANCING TRANSPORTATION THROUGH INNOVATIVE RESEARCH AND EDUCATION

- Reinforced that the system needs to be mobile friendly and user friendly. Similar to car insurance (i.e., State Farm) apps that make accident image capture and reporting clear, simple, and easy.
- **Would really benefit from access to more iPads with a cellular package**
- **Would benefit from hands on-training and the ability to submit dummy reports to build confidence in reporting**
- TES: Consider having special access for 1 person in barn for standard reporting. Concern from others on adding those responsibilities to an individual with the lack of staff.
- **Can a report be started by an individual and then assigned to another to complete? Can one be started, saved, and finished later by the same individual that is not a licensed user?**
- **Could someone in the field with poor cell coverage or other issues call someone else to start a report?**
- Consider automated phone reporting system where a number is called and standard questions are asked to start the report then a link sent to upload photos/videos
- **Are task-based job briefings included and readily accessible in the system? Same for equipment inspection walkarounds**
- **Several significant concerns on having hardware and connections to participate. Pushback on using personal devices. How would equipment inspections be done efficiently with a single iPad in the barn? Suggestion to complete a paper equipment inspection and take a picture with an iPad.**
- If work is repeated for multiple days, is there a job briefing needing for each day? Could one be done that covers multiple days?
- **Have a checklist and make clear what information is needed to complete a report. Have it alert people to what's missing.**
- **Can reports be modified to add information as new info comes in (i.e., police reports)**
- **How will this rollout? Since D12 and D5 are focus groups, will we be the first to use it or will it go statewide?**

Feedback on branding (5 minutes)

- Seemed to like Safety Performance and Reporting Kit (SPARK). Like the idea of naming it something for quick and easy reference. SPARKY!

Closing and timeline (5 minutes)

- Thanked attendees and presented a timeline for rollout

Safety Management System Focus Group

District 12

Potential Dates: Wednesday March 15th
Time: 11am-12p
Location: 109 Loraine St.
Pikeville, KY 41501

Goal: Introduce district employees to the new safety management system, gather feedback, and discuss branding

Attendees: 12 crew and supers, 5 TES, DSC, and CDE

Minutes:

Introductions (5 minutes)

Introduction of the Safety Management System (15 minutes)

- Electronic Safety Reporting System from 3rd party provider
- Moving safety reporting from paper to electronic system
- Help us be more proactive v reactive
- Web based, via phone/tablet/PC, single source of safety data, can use photo/video
- Immediately notify safety coordinator and workman's comp
- More efficient analysis and reporting – real time
- PPE/Hazardous material
- Not called ORIGAMI
- Will all be pulled into 1 safety management system
- Improved workflow- incident and near miss reporting- report, notifications immediately sent, que supervisor for investigation, workman's comp, damage/equipment repair/clean up
- Different levels of access/responsibility within the system depending on position and job title
- Do not currently have a good way of tracking: workflow, safety issues, near misses
- Started with TxDOT

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- Too reactionary, not nearly proactive enough in current system
- Do not want to take more time away from work for administrative duties

Questions (5 minutes)

- Scenario with Tim- wind damage, work permit, list of PPE, job briefing, THEN go do your job, will not have to fill out 14 pages of paperwork
- **Verifying- signatures of attendees during a job briefing.**
    - How do you confirm
        - Similar form in the system, have a way to record attendance with data entry. Could do photo but exploring options.
        - Looking at defining a list of jobs and keying which JHA will go with it.
- **Will notifications be pushed through an app? Or other alerts?**
- **Notifications for trainings, gloves, PPE, safety checks, vehicle service, equipment tracking, AED**
    - Does the system not just document when inspections have occurred but will it alert to when a future inspection is needed?

Feedback on anticipated use (25 minutes)

- Motivate to Use:
    - User Guides
    - **Training Sessions**
    - Less paperwork
    - Auto-populate personal information
    - Help us think through everything we need prior to going to jobs
    - Seat belt report for supervisors
    - **SDS sheets for chemicals/hazardous waste – will not have to go back to facility to find book and look up protocols**
    - Real time awareness to all techs
- Barriers to Use:
    - **Connectivity. Crews use their own devices?**

- **Job Changes after they perform their job briefings. Will it have to be completely re-done?**
- Learning curve
- **Change is hard- Need in-person training sessions - test reports (aka dummy workflows for practice)**
- Verifying Signatures

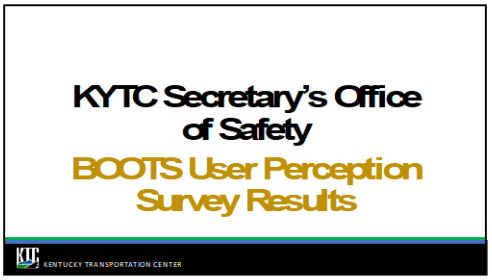
Feedback on branding (5 minutes)

- Safety Performance and Reporting Kit (SPARK)

Closing and timeline (5 minutes)

- Thanked attendees and presented a timeline for rollout

Appendix C – Post-Rollout User Perception Survey Briefing


KYTC Secretary's Office of Safety
BOOTS User Perception Survey Results
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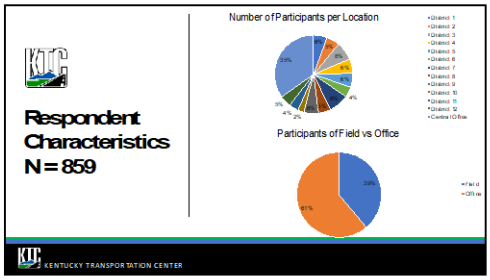
Respondent Characteristics N = 859
Number of Participants per Location
Participants of Field vs Office
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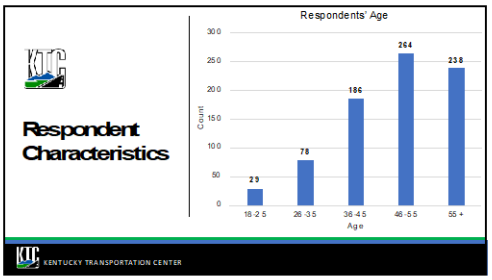
Respondent Characteristics
Respondents' Age
Count
Age
18-25
26-35
36-45
46-55
55+
29
78
186
264
238
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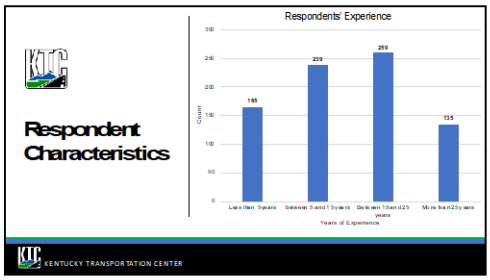
3


Respondent Characteristics
Respondents' Experience
Count
Years of Experience
165
229
259
135
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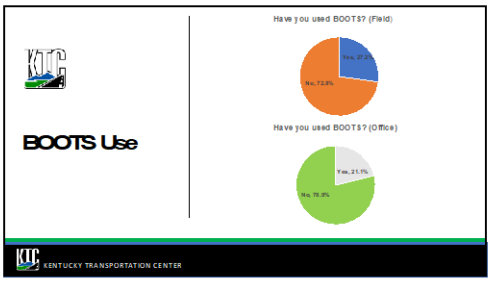
BOOTS Use
Have you used BOOTS? (Field)
Have you used BOOTS? (Office)
KENTUCKY TRANSPORTATION CENTER

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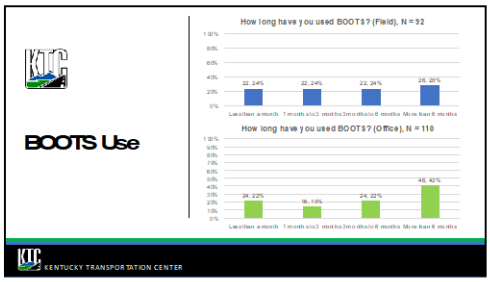
BOOTS Use
How long have you used BOOTS? (Field), N = 92
How long have you used BOOTS? (Office), N = 116
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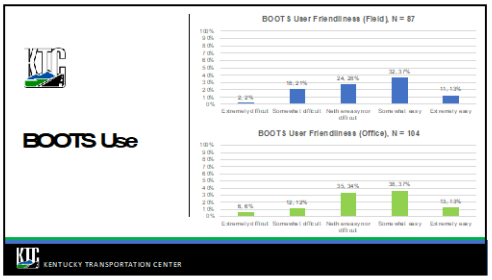
BOOTS Use
BOOTS User Friendliness (Field), N = 87
BOOTS User Friendliness (Office), N = 104
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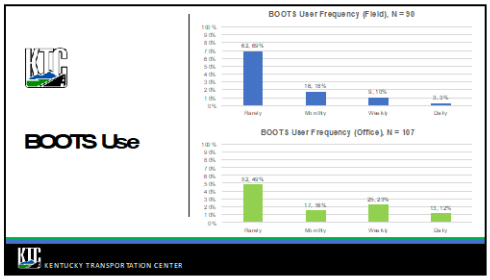
BOOTS Use
BOOTS User Frequency (Field), N = 90
BOOTS User Frequency (Office), N = 107
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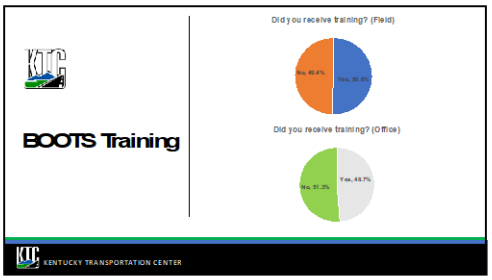
BOOTS Training
Did you receive training? (Field)
Did you receive training? (Office)
KENTUCKY TRANSPORTATION CENTER

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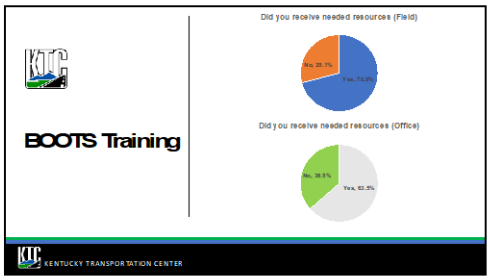
BOOTS Training
Did you receive needed resources (Field)
Did you receive needed resources (Office)
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BOOTS Training
Training Adequacy (Field), N = 46
Training Adequacy (Office), N = 57
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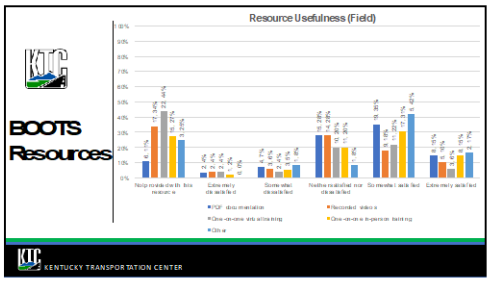
BOOTS Resources
Resource Usefulness (Field)
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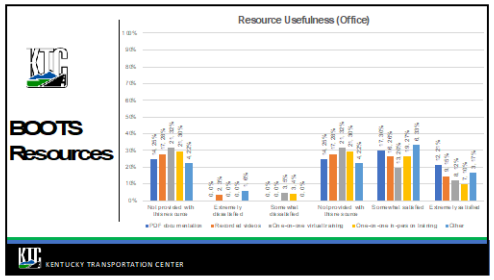

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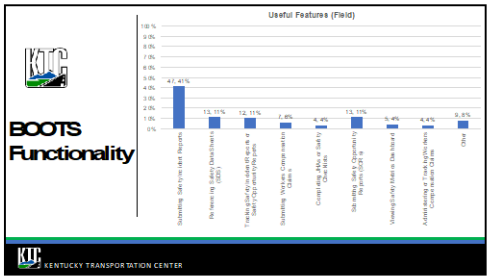

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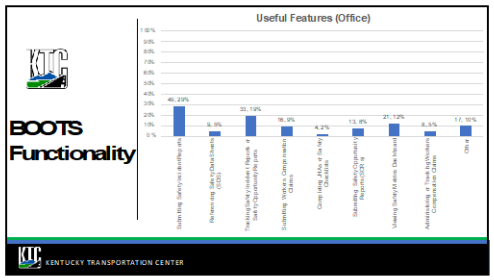

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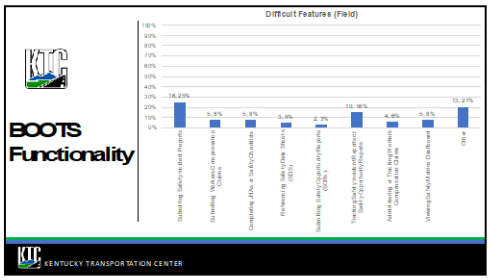

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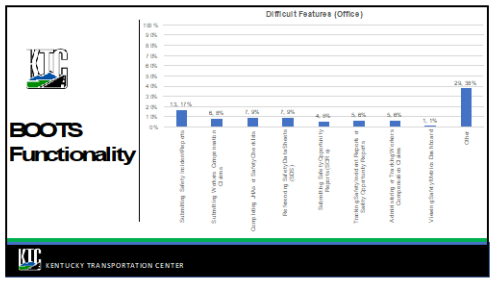

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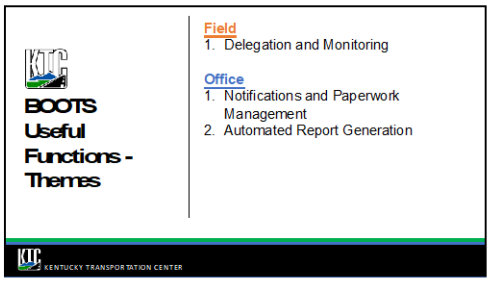

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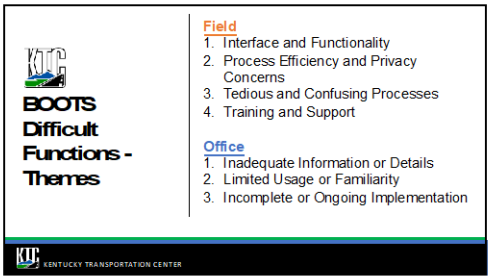

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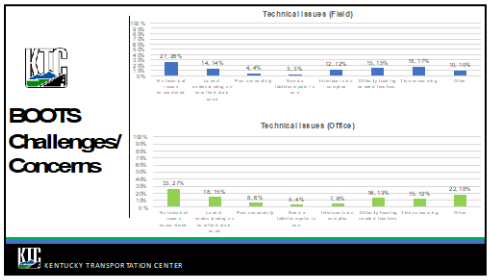

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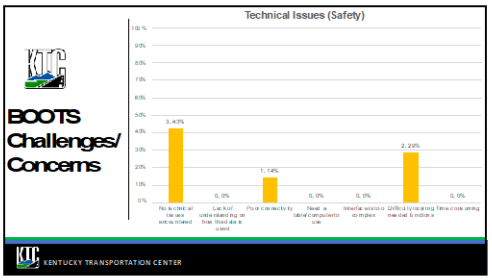

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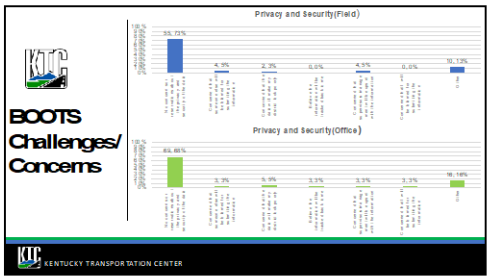

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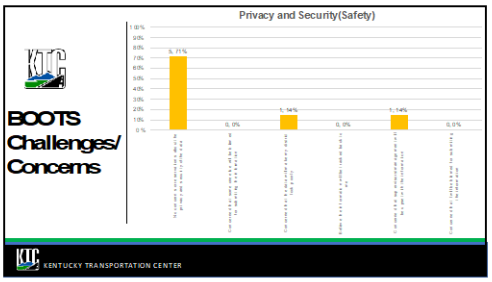

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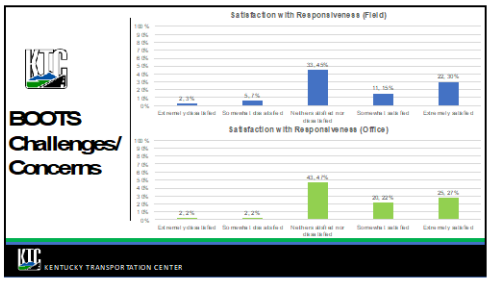

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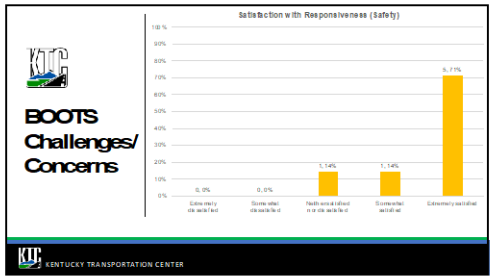

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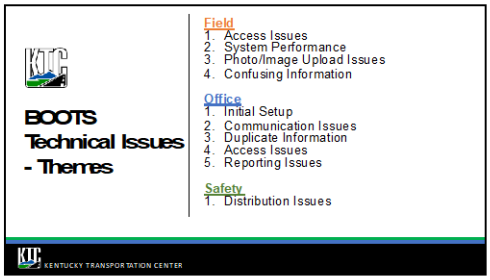

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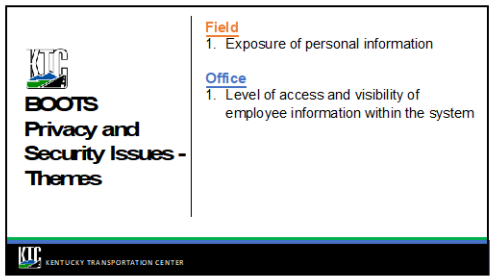

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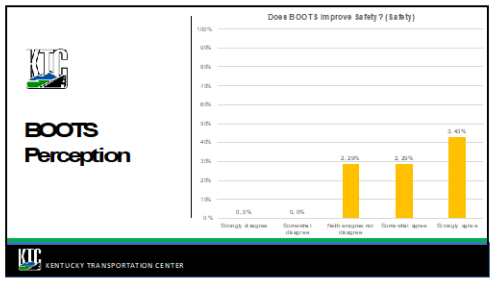

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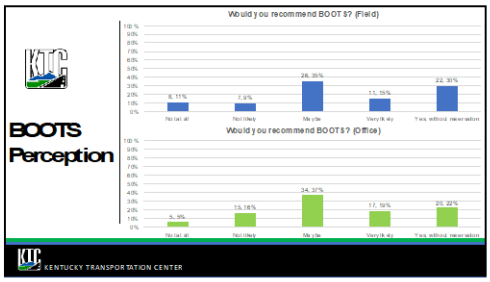

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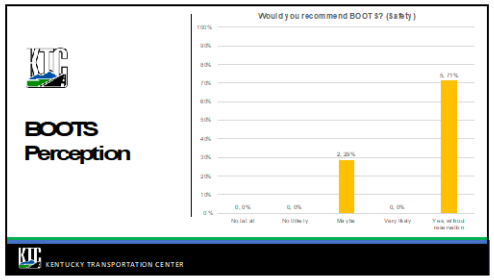

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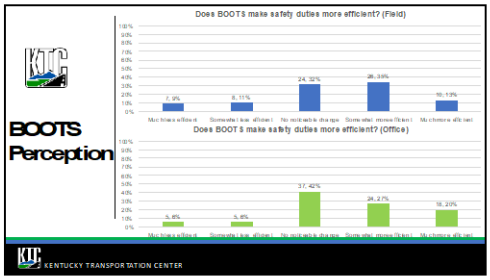

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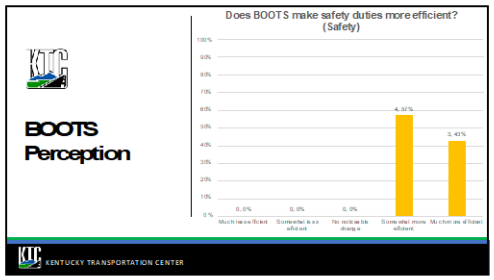

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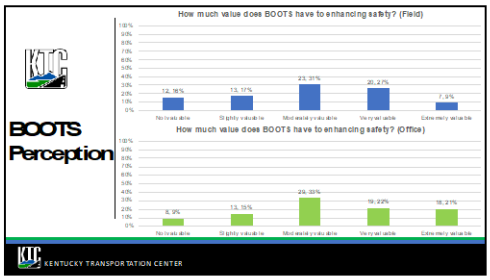

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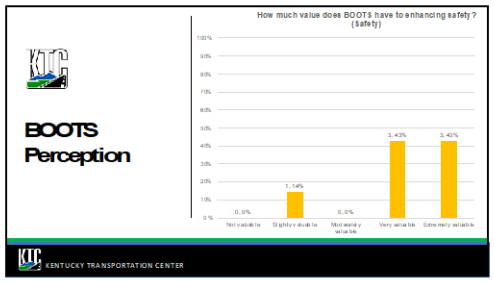

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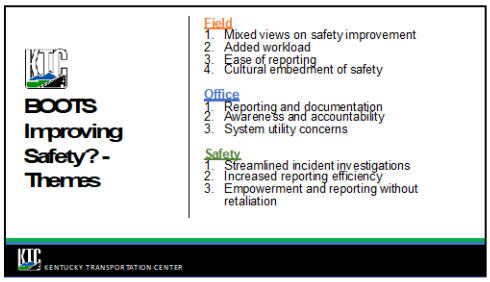

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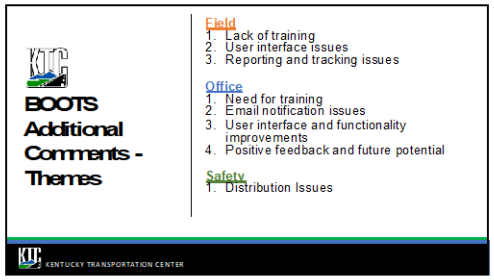
BOOTS Additional Comments - Themes
Field
1. Lack of training
2. User interface issues
3. Reporting and tracking issues
Office
1. Need for training
2. Email notification issues
3. User interface and functionality improvements
4. Positive feedback and future potential
Safety
1. Distribution Issues
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