

APPLYING SMART PRINCIPLES TO IMPROVE SUPERVISOR COMMUNICATION AS A LEADING INDICATOR OF OSH

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ABSTRACT

Although occupational safety and health (OSH) management continues to prevail as a necessary part of employee performance, few methods exist to assess leading indicators of OSH in real time. Longitudinal research on a critical area within OSH management—supervisor communication—was completed by NIOSH. Researchers analyzed archived supervisor communication given to their workers via a mobile app adopted by a large company. The study content analyzed 2,136 communicative feedback provided by 28 supervisors to employees of the company from October to December 2019. Qualitative analysis applied principles of being specific, measurable, achievable, relevant, and time-based (SMART) to determine the presence of leading indicators in these daily communications. Supervisors gave feedback that was specific to a hazard in 21.9% of the acknowledgements analyzed; 1.2% contained aspects that were measurable; 6.8% were achievable; 5.5% were relevant, and 2.3% were timely. Most of the communication (73.5%) consisted of general, supportive feedback. The discussion shows possible ways to apply SMART principles to enhance supervisor communication as a valid leading indicator.

INTRODUCTION

There is both an analytical and practical interest in the consistent use of leading indicators to support occupational health and safety (OHS) performance (National Safety Council [NSC], 2015; Sinelnikov et al., 2015). Leading indicators help identify hazards that can be avoided or controlled to an appropriate level as well as identify root causes to help mitigate risks, making them extremely valuable in health and safety (H&S) performance (Eid et al., 2012). The importance of leading indicators is emphasized in many health and safety management system (HSMS) frameworks including the updated ISO 45001 (2018) standards to promote a positive culture and improve organizational performance. Industry stakeholders, such as the International Council on Mining and Metals (ICMM), also support the development and application of leading indicators to prevent health and safety incidents (2012).

Research-to-practice studies have argued that using daily H&S incident information is the best data to collect, combine, and use to predict unanticipated outcomes (Kohler, 2015; NSC, 2015). One job of supervisors is to identify and improve the application of leading indicators such as toolbox talks or safety trainings throughout the workday. Coincidentally, supervisor communication as a prominent leading indicator is often acknowledged but rarely assessed for potential improvement. Understanding how supervisors communicate with their workforce about health and safety, including strengths and weaknesses in their communication practices, can encourage the development of applicable dissemination strategies to promote positive behaviors among the workforce. To that end, it is important to identify

how leaders discuss and implement compliant H&S performance via their own communication practices.

The utilization of common goal-setting frameworks is a plausible way to guide the identification of tangible communication, mentoring, and resource allocation. In the current study, supervisor feedback that was sent to their employees via a mobile safety app was analyzed over a three-month period. The feedback was qualitatively coded using the principles of being specific, measurable, achievable, relevant, and timely (hereafter referred to as SMART). Results revealed that supervisor feedback is predominantly focused on providing encouraging support. To that end, there are several ways in which supervisors can improve the informational and resource support provided to workers such as promoting goal setting and skill development to prevent H&S incidents. Specifically, using the SMART framework revealed several implications for improving communication to serve as a viable leading indicator.

Occupational Health and Safety (OSH) Leading Indicators

A leading OHS indicator is a measure of health or safety that can help predict the future of negative incidents (Hallowell et al., 2013). Leading indicators aim to: 1) maximize safety performance by measuring, reporting, and managing safety behaviors (Toellner, 2001), 2) identify gaps in risk control during routine checks of a critical activity within the risk control system (Health and Safety Executive [HSE], 2006), and 3) directly relate to safety management activities or are measures of the activities themselves (Hopkins, 2007). The use of leading indicators can also represent the quality of a worksite's intervention implementation (Haight & Thomas, 2003; Manuele, 2009; Wachter, 2012). As an example, near-miss reports have been advocated as a strong leading indicator of H&S with the intent to improve safety performance and to learn what actions can help prevent a future incident (Haas & Yorio, 2019; Hinze et al., 2013).

Research has discussed the need to use "leading" indicators as opposed to traditional "lagging" indicators (Haas & Yorio, 2016; Juglaret et al., 2012). While leading indicators play an active role in monitoring H&S, lagging indicators encompass reactive monitoring (Hopkins, 2009, 2007; Reiman & Pietikainen, 2012). More specifically, Toellner (2001) states, "Leading indicators are measurements that are linked to preventative actions whereas lagging, or trailing indicators, are linked to the outcome of an accident" (p. 42). In other words, leading indicators intend to drive H&S performance, not react to it (Minnick & Wachter, 2019). There is widespread acceptance that failure-based measures are not as useful in aiding organizations to drive continuous safety efforts (Nazarpour et al., 2018), and as a result, leading indicators around unsafe conditions are recorded and assessed to help prevent catastrophic incidents (Leveson, 2015). Specifically, lagging indicators, such as accident statistics, are passive and cannot predict possible incidents (Brauer, 2016; Chen & Yang 2004; Nazarpour et al., 2018). Therefore, focusing on efforts such as risk assessments, safety committee meetings, pre-shift meetings, near-miss reports, and safety climate may provide more practical utility for OHS practitioners.

Although OHS practitioners collect an abundance of leading indicator data, there is consensus that the actual use of these indicators to measure OHS performance is not clear; however, use of

indicators are essential for driving continuous improvement (Agnew, 2013; Reiman & Pietikainen, 2010). Leading indicators should not be adopted in isolation but used within an overarching health and safety management framework to facilitate OHS improvement (Hopkins, 2007; ICMM, 2012). This holistic implementation approach often rests on the weight of organizational management and, as a result, their communication and engagement efforts serve as a critical leading indicator. However, supervisor communication is seldomly selected as a consistent, formal leading indicator and analyzed to identify strengths and weaknesses of health and safety management on the job.

Supervisor Communication as a Leading Indicator: Recently, the use of leading indicators to measure both organizational and individual performance has been elevated in importance (Minnick & Wachter, 2019). Research suggests that the practices of supervisors play a critical role in developing and sustaining a safety culture in the workplace (Neal & Griffin, 2006; Zohar & Luria, 2004). Specifically, safety communication and engagement by upper management has been demonstrated as a valid leading indicator for predicting employee safety performance (Hallowell & Gambatese, 2009; Salas & Hallowell, 2016). Others have also determined through their own identification methods that supervisory support is a prevalent leading indicator (Guo & Yiu, 2015) as well as the incentives and praise they provide to employees (Hallowell et al., 2013). Consequently, supervisors are at an increased need to be accountable and efficient in their daily communication and role-model efforts.

Supervisors oversee that employees meet production goals each day. These efforts do not necessarily translate to overseeing or improving employee H&S outcomes. Research has shown the value of general communicative exchanges between supervisors and their employees, particularly related to encouraging safety over production (i.e., Zohar & Polacheck, 2014). However, there is a lack of research on performance measures to evaluate safety professionals (Minnick & Wachter, 2019). Part of this gap may exist because there is not a standard use of terminology in relation to supervisor communication and goal setting with employees (Bowman et al., 2015). Additionally, there has not been much research on the actual communicative interactions between supervisors and their employees. Only recently has research expanded into this qualitative realm, with some efforts being made to categorize if supervisor communication focused more on tasks, safety, or compliance (Newnam & Goode, 2019). Understanding these issues is important, as leadership is expected to translate policies and processes into practice which, over time, builds workplace norms (Bhattacharaya & Tang, 2013; Zohar & Luria, 2003).

Another reason scrutiny in supervisor communication as a leading indicator may be neglected is the lack of methods to formally assess daily feedback. Most studies on supervisor and employee communication have focused understandably on interaction theories. For example, the Social Exchange Theory (SET) studies how relationships develop in large organizations as a result of certain interactions (Eisenberger, Fasolo, & Davis-LaMastro, 1990). Such studies have shown the relationship between feedback and outcomes. However, no studies have used alternative frameworks to assess the details of supervisor feedback. To that end, an alternative, more purposeful framework is needed to assess the quality and impact of supervisor feedback. Specifically, identifying the prevalence of specific, measurable, achievable, relevant, and timely (SMART) communication practices may assist this effort. Efforts that utilize the five SMART principles may subconsciously alter supervisors' behavioral antecedents and assist with targeting behaviors that can enhance employee achievements (Geller & Clarke, 1999). To that end, NIOSH researchers felt that it was important in this study to identify relevant communication practices that could be used to raise awareness and reduce potential incidents.

Using SMART to Evaluate Supervisor Communication

A relatively new concept, SMART, stands for specific, measurable, achievable, relevant, and time-related methods for goal development and management (Doran, 1981). This framework has become a common standard for developing effective and measurable goals in the workplace (Bovend'Eerd, Botell, & Wade, 2009), including at organizations like the Centers for Disease Control and Prevention

(CDC, 2013). Bovend'Eerd and colleagues (2009) indicated that goal setting with SMART should target an activity or behavior and the necessary resources, whether tangible or intangible, to achieve the desired outcomes. There have been some variations of what the acronym stands for, but generally the following principles are used (Carlucci, 2010; Kjellen, 2009; Podgorski, 2015; OSHA, 2019):

- **Specific:** Who, what, when, where, and why, including expectations being outlined and avoiding excessive fillers in communication.
- **Measurable:** Specific numbers that are quantifiable, objective, and measure success.
- **Achievable:** Constructive insights and feedback on how to improve a behavior or process and provide resources and proper tools to accomplish the goal.
- **Relevant:** Connection to a greater goal with a focus on the main problem that should be accomplished without overstretching available capacity.
- **Timely:** Use of small goals more frequently to enhance the ability to meet deadlines.

Recently, the use of SMART has progressed and been applied to assess health and safety performance management. To illustrate, Podgorski (2015) determined that using SMART makes it easier to select targeted key performance indicators within a health and safety management system. Kjellen (2009) and Carlucci (2010) also came up with respective criteria for each of the five SMART principles, specifically around management system performance. These criteria are outlined later in this paper as they were used to assist in consistent coding efforts.

OHS regulatory agencies promote the use of SMART when developing leading indicators. For example, OSHA (2019) asserts that a good leading indicator is based on SMART principles. Further, Work Safe Alberta (2015) indicated that applying SMART principles can be an "effective approach to judging the merit and guiding the adoption of potential leading indicators" (p. 13).

Although frameworks for developing and auditing SMART goal statements has been done (Bowman et al., 2015), research has not applied SMART to evaluate communication feedback from supervisors to their employees. Considering that supervisor communication is a significant leading indicator of safety culture and overall worker performance, it is worthwhile to explore how SMART principles can be used to improve these efforts. Such an activity could explore if SMART, as a framework, can be used to identify strengths and weaknesses in how supervisors communicate and encourage health and safety performance while transmitting personal and organizational knowledge.

Research Questions: Attempting to satisfy all SMART criteria in one instance or process is unrealistic (Bjerke & Renger, 2017). Knowing that supervisor communication cannot always be specific, measurable, achievable, relevant, and timely, it is necessary to identify which of these aspects are more prevalent and where improvements can be made in how supervisors communicate with their workers from a proactive risk management perspective. To that end, feedback offered by supervisors to their hourly employees was qualitatively analyzed to assess the presence of SMART principles.

- RQ 1:** In what ways does supervisor communication, as a leading indicator, contain **specific** feedback?
- RQ 2:** In what ways does supervisor communication, as a leading indicator, contain **measurable** feedback?
- RQ 3:** In what ways does supervisor communication, as a leading indicator, contain **achievable** feedback?
- RQ 4:** In what ways does supervisor communication, as a leading indicator, contain **relevant** feedback?
- RQ 5:** In what ways does supervisor communication, as a leading indicator, contain **timely** feedback?
- RQ 6:** In what ways can supervisor communication that is aligned with SMART principles support worker performance?

METHODS

Instrument

A qualitative research approach was used to answer the research questions in this study. De-identified, archival data were received from Acknowlogy LLC (Salt Lake City, Utah) through Acknowlogy, a mobile safety application that engages everyone across an organization in working safely through easier and more open communication among employees. When employees log on to Acknowlogy, downloaded on their personal phones after being funded by their organization, they are prompted to complete the following: an H&S assessment, which varies each day; a related quiz; an observation; and finally, they acknowledge the daily H&S efforts of another coworker. The platform allows for a customized safety experience based on the needs of each specific organization, where employees can engage in thinking through safe behaviors, noticing dangers, and determining what they can do better. A common theme across the platform, regardless of the company using it, is the concept of leading indicator identification and generation (Arc Safety App, 2020).

Archival Data Collection

In the current study, only supervisor safety communication efforts are being studied as a leading indicator. Although all employee levels from hourly workers to company executives use the mobile application, Acknowlogy, this study only utilized the communication feedback (i.e., acknowledgements) provided from organizational leadership to other employees. Specifically, because supervisor communication has been shown to have a significant weight on employee performance (NIOSH, 2020) and research has revealed the types of communicative support that workers desire (Haas, 2020), it was important to know where there is room for improvement. Therefore, the data analyzed were those from senior management (i.e., presidents, vice presidents, directors), company leadership (i.e., safety managers/coordinators), and frontline leadership (i.e., supervisors). It is a rare opportunity that researchers receive actual communication relayed to the workforce. More often, researchers must rely on the recall ability of supervisors and their employees for this information as well as for honesty and specificity of those interactions. This study design allowed researchers to receive raw data in conversations that occurred on the job site between supervisors and employees, mitigating the normal research limitations.

Sample

Multiple companies and their respective worksites use this mobile platform. However, to avoid accounting for varying worksite cultures and their current processes for using the mobile app, acknowledgements from only one company were received for analysis. A large, multi-billion-dollar industrial company based in the Western United States, who also subcontracts work to other high-risk sectors, gave Acknowlogy permission to share their de-identified acknowledgement data with NIOSH for analysis. In January 2020, NIOSH received three-months' worth (October, November, and December 2019) of communication acknowledgements from those in supervisory roles only. In that timeframe, there were 2,136 acknowledgements provided by 28 supervisors to hundreds of employees.

Qualitative Data Analysis

This archival qualitative data was analyzed using theoretical content analysis procedures to organize, identify, analyze, and report themes that fell into the five principles of SMART (Braun & Clarke, 2006; Saldana, 2015). Content analysis in communication is a research technique for the "objective, systematic, and quantitative description of the manifested content of communication" (Berelson, 1952, p. 18). This manifest content is intended to be easily observable, which is the case of the verbatim communication feedback provided to employees in the mobile app. When using content analysis methods, all data is coded in a way so that researchers can break down the data and elucidate something new (Creswell, 2015). Creswell (2015) further discussed coding as a necessary process in qualitative research in order to make sense of dense, textual information, particularly as it relates to the research questions. To that end, after researchers became familiar with the nature of the data, they read and reread the text to identify and apply SMART principles as they were occurring in the supervisor communication (Boyatzis, 1998).

Because the analysis was deductive in nature, a coding framework that utilized academic and regulatory definitions of SMART was developed. Table 1 illustrates the definitions that were used when coding each communication instance for the presence of SMART principles. This coding framework provided an iterative approach to help deductively analyze and code the leadership acknowledgements to their employees while also providing a higher level of face validity to the analysis. Additionally, applying an existing framework to interpret the data helped justify the reliability and validity of the results (Potter & Levine-Donnerstein, 1999), which was important because the current findings are intended to be used for future interventions with supervisors.

Table 1. Definitions for Coding SMART Leading Indicators.

SMART Principle	Academic Guidance	OSHA Guidance
"S" – Specific	- Is it understandable by those receiving feedback (Kjellen, 2009)? - Is it concise (Carlucci, 2010)?	Does the leading indicator (i.e., supervisor communication) provide a call to action that employees can apply to minimize risk from a hazard or improve a program area (OSHA, 2019, p. 2)?
"M" – Measurable	Is it quantifiable and allow for comparability and consistency at different time periods (Carlucci, 2010)?	Does the leading indicator present any numbers, rates, percentages, etc. that allow tracking and evaluating trends over time (OSHA, 2019, p. 2)?
"A" – Achievable	- Is there reference to resources to help achieve the goal (Kjellen, 2009)? - Are the resources provided (human, technical, information, etc.) enough for achieving the goal (Podgorski, 2015)?	Can the intended employee(s) reasonably achieve the goals that were set forth (OSHA, 2019)?
"R" – Relevant	- Is it valid and representative (Kjellen, 2009)? - Does it allow enough flexibility of current or future actions (Carlucci, 2010)?	Does the leading indicator help track progress or barriers to help meet goals (OSHA, 2019)?
"T" – Timely	Does it include a timeline that can be divided into stages (Podgorski, 2015)?	Ability to track the leading indicators regularly to spot meaningful trends from within the data (OSHA, 2019)?

Researchers used Table 1 to employ a projective content process to coding the data. In other words, one coder read and analyzed the data with the belief that the communication practices were trying to relay some type of information back to the employees (Potter & Levine-Donnerstein, 1999). After feedback was coded within the Excel file in which the original data was received, the presence and absence of the SMART principles were calculated. The final codebook contained definitions of the five SMART principles, data with assigned SMART codes, and justifications for coding decisions.

The codebook was shared with two individuals to support norm-based coding efforts. Because the sample was so large, norm-based coding was used rather than calculating reliability coefficients. Norm-based coding occurs when many coders can agree on a perception, giving reliability to that perception (Elliot, 2018). During this step, questions and potential discrepancies in interpretive differences could be discussed and resolved. In the current analysis, perceptions were similar, and when differences arose, it was mainly due to the interpretation that the communication feedback could fall into more than one SMART principle. It did occur in a few instances where communication from supervisors could contain more than one of the SMART principles, and when this was brought up, it was checked to assure this inclusion was accounted for in the final codebook. Alternatively, communication could contain none of the SMART principles, which will be discussed more in the Results section that follows.

RESULTS

Research has shown that supervisors can help workers set meaningful goals that are easy to measure and improve safety outcomes (Roux, 2018). SMART is considered a useful process for setting tangible goals in health and safety. Relatedly, researchers felt that the same concept could be applied to help communication feedback serve as a H&S leading indicator on the job. Of the 2,136 communication events coded, supervisors gave feedback that was specific about a health or safety hazard in 21.9% of the acknowledgements; 1.2% contained aspects that were measurable; 6.8% were achievable; 5.5% were relevant, and 2.3% were timely. Most of the communication (73.5%) consisted of supportive feedback but was absent of information that could help workers improve subsequent performance. The results indicate how supervisors can improve the information they provide to their workforce to encourage the desired execution of H&S practices on the job. The tallied results of the qualitative content analysis coding are provided in Table 2.

Table 2. Presence of SMART Principles in Supervisor Communication Efforts.

User ID	Feedback Quantity	Specific n %	Measurable n %	Achievable n %	Relevant n %	Timely n %	Not Applicable n %
120	54	32 59.3	2 3.7	16 29.6	9 16.7	3 5.6	18 33.3
1242	108	36 33.3	6 5.6	16 14.8	18 16.7	11 10.2	53 49.1
1389	96	34 35.4	1 1	4 4.2	9 9.4	12 12.5	51 53.1
1391	131	54 38.9	5 3.8	19 14.5	12 9.2	4 3.1	68 51.9
1393	152	23 15.1	—	4 2.6	5 3.3	1 0.6	127 83.6
1394	94	9 9.6	—	2 2.1	2 2.1	1 1	84 89.3
1396	84	13 15.5	—	2 2.4	1 1.2	2 2.4	70 83.3
1397	54	13 24.1	—	—	3 5.6	1 1.9	39 72.2
1399	96	9 9.4	—	3 3.1	1 1	1 1	84 87.5
1400	10	1 10	—	—	—	—	9 90
1402	118	19 16.1	—	6 5.1	3 2.5	2 1.7	94 79.7
1405	58	22 37.9	1 1.7	6 10.3	7 12.1	3 5.2	35 60.3
1406	111	17 15.3	3 2.4	4 3.6	7 6.3	3 2.7	87 78.4
1407	69	12 17.3	—	9 13.4	2 3	1 1.5	49 71
1427	77	14 18.2	1 1.3	2 2.6	1 1.3	—	63 81.2
1428	22	3 13.6	—	1 4.6	1 4.6	—	19 86.4
1429	116	25 21.7	1 0.8	12 10.4	9 7.8	2 1.7	98 85.2
1447	91	15 16.5	—	4 4.4	4 4.4	—	75 82.2
1454	80	12 15	—	3 3.8	2 2.5	—	66 82.5
1464	16	3 18.8	—	1 6.3	—	—	13 81.3
1466	12	—	—	—	—	—	12 100
1480	41	18 43.9	—	4 9.8	4 9.8	—	22 53.7
1491	133	52 39.1	1 0.8	20 15	15 11.3	—	77 57.9
1515	8	—	—	—	—	—	8 100
1517	127	19 15	—	4 3.2	1 0.8	—	107 84.3
1535	38	6 15.8	—	1 2.6	—	—	32 84.2
1538	17	6 35.3	2 11.8	3 17.7	2 11.8	—	11 64.7
1606	99	3 3	—	—	—	1 1	97 98
Total	2,136	467 21.9	23 1.2	146 6.8	118 5.5	49 2.3	1,569 73.5

The analysis generated interesting and applicable findings. First, it was relatively straightforward to use SMART principles to assess supervisor communication practices, showing the transferability of using SMART to not only develop goals but also execute them. Second, there were clear trends that can be sorted into strengths and areas of improvement in supervisor communication. This latter finding is discussed below, organized by the five SMART principles.

Specific Communication

The most common principle that was executed by supervisors was being specific. In total, 467 or 21.9% of acknowledgements aligned with this principle. Additionally, 92.8% of supervisors in the sample provided some level of specificity in their feedback. In this occurrence, researchers were looking for communication that provided specific action or knowledge that the receiving worker could take and use to either minimize a hazard or risk or improve something on site (OSHA, 2019). Examining the feedback for features that included clear expectations, precise information about a hazard identified, or reinforcement and expansion of a hazard identified, was common in the feedback that was coded. For example, Supervisor 1242 stated to an employee, "Great job. Inspections should never vary based on the tool. Another area is body positioning that should never change based on the tool. Keep up the great work." This supervisor's feedback entailed information about consistency of inspections and focused on body position as a specific aspect that should not waver based on the tool being used. Additionally, Supervisor 1406 focused on expanding his employee's knowledge about silica dust stating the following:

Silica dust is problematic on many levels. In addition to protecting your lungs with a particulate respirator, be sure to also protect your eyes and skin. Gloves are great, but long sleeves and goggles in addition are things to think about. Silica has many ways of causing irritation to our bodies. Try to always use a dust collection system when at all feasible.

Based on the content in this acknowledgement, it is likely that the supervisor was provided with the workers' assessment about respirable silica and wearing a respirator to protect him/herself. The supervisor agreed with his employee but then expanded upon this assessment to educate about other types of PPE to consider when working around respirable silica. Almost a quarter of the acknowledgements contained information that was specific enough for an employee to learn from and later to incorporate into future work activities.

Measurable Communication

Being measurable in communication occurred the least among the five principles. In the current analysis, only 23 or 1.2% of the acknowledgements provided some level of measurement that

employees could specifically use. These 23 occurrences came from 35% of the supervisors. According to OSHA's (2019) leading indicator guidelines, a measurable principle presents "numbers such as rates or percentages that allow workers to track and evaluate trends or successes over time" (p. 2). It was rare to nonexistent that supervisors provided a specific measurement for employees to track. Rather, communication that was measurable was more likely to provide objective, quantifiable direction for employees.

As an example, Supervisor 1389 encouraged one employee by saying: "Good observation [blank], keep everyone focused by communicating with each person one-on-one and then in safety meetings." Although this is not a specific measure to track over time, this supervisor does provide a specific, quantifiable goal of communicating with people individually and in groups. This measurable goal can be checked off as completed or not, making it a measure of worker performance. There were several acknowledgements that fell into this objective, quantifiable category of supervisors challenging their employees. Other examples included feedback to choose three people to follow up with that workday or to pick one new skill to learn or relearn that day and then teach someone else. Perhaps this type of feedback is more practical and translatable than promoting a specific percent as a goal.

Achievable Communication

Goals can be more achievable by proposing a certain time frame. However, when encouraging someone to achieve a goal, it is important to provide the proper resources and tools to complete the job in a reasonable timeframe (OSHA, 2019). A principle can also be thought of as achievable if it supports worker self-efficacy (Geller, 2002). Consequently, when coding the supervisor communication for goals that were achievable, researchers identified incidents that included constructive insights and feedback on how to improve but also included, and more importantly for this principle, a reference or availability of the proper tools or resources needed to complete the goal. Of the 2,136 acknowledgements, 146 or 6.8% were coded for containing achievable goals or information and came from 82.1% of the supervisors.

One of the simplest acknowledgements that was deemed achievable was feedback that encouraged employees to get their assessment card done for that day or participate in a daily huddle to avoid complacency – which are both simple, five-minute tasks. However, other feedback was much more detailed and went into aspects of resource needs. For example, Supervisor 1393 indicated, "Great, just a reminder on heaters, don't forget to have a CO meter. If you need one, please contact me [phone number]." In this feedback, the supervisor gives specific insight on the necessity of needing a CO meter and then goes so far as providing his personal number if the employee needed this physical resource to maintain safety on the job.

Additionally, several communication acknowledgements from supervisors that were coded as achievable provided specific, constructive feedback about how to improve hazard assessment strategies on the job. One example came from Supervisor 1491 when he said, "I need more info for what you are doing for safety. An example would be: 'I have talked to the guys running the pump hose to ensure clear understanding with the pump operator, talked to the guys running the stingers to be aware and to change out if needing a break, if pour is elevated check and re-check access and egress.'" Providing this level of mentoring is a resource for employees to increase and use their own skills on the job to prevent incidents, and it provides clear expectations of what is deemed as acceptable in terms of effort. It is important to be achievable in communication because if not, morale of the workforce can decline (Geller, 1997).

Relevant Communication

In terms of being relevant, communication, while starting at a broad level, should eventually connect to a bigger goal of the company or safety outcome. To participate in any sort of goal or other activity on the job, Bandura (1997) argued that workers must perceive their actions will be worth the effort. In the current data, researchers strived to discover acknowledgements that included solving a main problem to achieve a larger goal, all without overstretching the organization's

capacity (OSHA, 2019). The results of the coding showed that 118, or 5.5%, of supervisor acknowledgements contained relevant communication. These 118 cases came from 78.6% of the supervisors.

An example of feedback that was highly relevant to the receiving worker was Supervisor 1242 when he said, "Good job. When reminding folks about the simple things such as PPE it might help to make it personal. What is driving the employee to want to go home tonight and a reminder that stuff like our PPE helps improve that possibility by reducing our exposure to injury." This supervisor attempted to make the topic of PPE more manageable for his employee by encouraging the use of personal experience to build the knowledge of other coworkers. Other supervisors brought up the completion of other daily tasks and connected those tasks to the greater goals of health and safety on site. For instance, Supervisor 1389 said, "Hi, when we ask our team to 'stop and think', I believe it gives them an opportunity to check for hazardous conditions that may have went unseen or undiscovered, and gives the opportunity to make corrections and communicate to those around them or their supervisor for help; keep up the good work!" This supervisor expanded on the overall purpose of completing safety cards. This feedback was detailed and relevant enough to encourage consistent actions by the receiving employee.

Timely Communication

Principles that are timely are known to entail deadlines to help track indicators or trends in outcomes (OSHA, 2019). Additionally, and more often the case in the current study, timely feedback contains small goals that can be achieved more easily and frequently. Of the 28 supervisors, 53.6% provided some feedback that contained timely principles. Of the 2,136 acknowledgements, 49, or 2.3%, were timely. Most of the supervisor feedback that was coded for being timely referenced an action or behavior that was necessary during a specific time of day, time of year, or specific incident, which functioned as providing a short-term goal or reminder. As an example, Supervisor 1407 noted the value of knowing personal roles during an emergency and what to do in order to respond quicker. Similarly, Supervisor 1405 encouraged an employee to take a few extra minutes to reintroduce procedures on site immediately after returning from a holiday. Finally, Supervisor 1394 indicated, "It's always good to review lock-up procedures and talk about where your risk points are at the end of each day," also referencing a specific time point and task associated with it.

DISCUSSION

A qualitative content analysis was used to organize 2,136 communication data points to identify, analyze, and report the presence of SMART principles in communication feedback to employees. Approximately one-quarter of the acknowledgements contained at least one SMART principle when providing feedback to employees via a mobile app. Although numerous other theories or frameworks could have been used to assess the communication, SMART was used for its tangible examples utilized in common goal-setting scenarios. Additionally, SMART has recently been used as a tool for developing obtainable leading indicators (OSHA, 2019), which supervisor communication is considered within an overall occupational safety and health (OSH) management system (Hallowell & Gambatese, 2009; Salas & Hallowell, 2016). Finally, the use of SMART made the common questions of "What does good communication look like?" and "How can it be formally documented?" (Willmer & Haas, 2016) a little easier to assess from an objective standpoint. Besides expanding the application of a commonly used framework, the results revealed strengths and missed opportunities in how supervisors provide feedback to their employees. The discussion focuses on these topics as well as considerations for modifying future communication efforts, including the potential utility of mobile apps as a communication supplement for supervisors who cannot spend their days traversing worksites to have a face-to-face conversation with their employees.

SMART versus Supportive Communication

Typically, being specific, measurable, and relevant are straightforward when setting goals (Bjerke & Renger, 2017). In the

current study, being specific, achievable, and relevant in supervisor communication were more common. Related to occupational H&S, SMART goals usually focus on either the development or implementation of health promotion activities. Examples include asking specific questions related to occupational H&S issues or educating workers to make outcomes more achievable. Researchers observed these efforts in the supervisor communication that was analyzed.

Alternatively, being measurable and timely was not as intuitive for supervisors. At face value, the lack of specific, quantifiable numbers to identify gaps was deemed as a flaw in the feedback. However, based on previous research on supervisory communication practices, communication that aligns with principles of being measurable has not been deemed as effective, primarily because employees are already responsible for concrete, measurable tasks throughout the day (Bjerke & Renger, 2016). Rather, practices that are specific and relevant have been shown to be exuded via supervisors' extrinsic safety motivation. Specifically, in the current sample, supervisors were more likely to be specific in their feedback by agreeing with and expanding upon risk assessments provided. These results are consistent with other data that has shown a presence of informational and tangible support provided by mine supervisors to their employees (Haas, 2020). The results of this earlier qualitative analysis using field interview data showed that mineworkers want to receive "task challenges" from their supervisors to encourage skill building on the job (Haas, 2020).

Likewise, the current results illustrated that, by way of being "specific" in expanding upon workers' risk assessments to inform and support safety processes, supervisors consistently executed extrinsic safety motivation practices (Probst & Estrada, 2010). Extrinsically motivated feedback that provides specific, detailed risks that workers may face while completing a task has been shown to increase workers' compliance and reduce the likelihood of injuries (Neal & Griffin, 2006). Therefore, continuing to encourage supervisors to share their knowledge and personal experiences when communicating with their employees is a positive trend observed in the results and a worthwhile endeavor to continue. Although trying to build in quantifiable information to relay back to the workforce could help make tasks more measurable and achievable, the reality is that it may not have an impact on whether workers complete their tasks in a safe way.

It is worth noting that, although approximately one-quarter of the data contained at least one SMART principle, 73.5% or 1,569 acknowledgements did not include any principle of SMART. In other words, the communication did not necessarily function as a leading indicator on the job. These results are consistent with other research showing that, although almost supervisors believe they should caution employees who are taking risks on the job, only a small percentage report providing this critical feedback to reduce potentially risky behaviors (Williams & Geller, 2008). Given the similarity in results, this points to a gap in supervisor knowledge in how to effectively communicate with their workforce about risks.

In the current study, these communications to employees were often short notes of encouragement such as "Safety first," "Keep up the good work," or "Zero injuries are always the goal." This language, although supportive, offers no specific H&S feedback to help proactively mitigate future risks or incidents (i.e., not a leading indicator). We are not making recommendations about the prevalence of this communication with employees; however, within OHS management, a poor example of a SMART goal or feedback is "zero injuries" because it abuses the concept of goal setting (Geller, 2002). Geller argues that zero injuries is an appropriate vision but not useful for discussing process activities that may change continuously.

Specifically, this feedback provides no opportunity for employee skill building nor challenges the employee to put in more effort on their next H&S assessment. Research has shown the value of supervisor role modeling and informational feedback in creating workers' sense of belonging on the job and desire to increase competence (Bakker & Demerouti, 2007; Jennings & Britt, 2017). Therefore, it might be useful for supervisors to take additional time to add on to their supportive feedback to also provide tangible information or daily challenges to their workforce. To that end, developing interventions to educate

supervisors around the principles of SMART and how they can be used as a tool to help their communication function as a leading indicator of safety may be a worthwhile effort for companies.

Implications for Communication Modes, Mediums, and Interventions: Communication is often fuzzy and nonspecific, which can cause misunderstandings, productivity loss, poor performance, and lack of trust (Zamani, Banihashemi, & Abbasi, 2020). The results demonstrate that it is possible not only to apply the principles of SMART to existing communication, but that managers can also frame their messaging in a way that is concise and active while improving overall system performance. Small changes in supervisors' daily communication practices can make a big difference in not only the employee's ability to follow through but also the supervisor's ability to follow up on performance. For example, it is easier for managers to follow up with employees to evaluate performance if they encouraged them to discuss a site-specific hazard with two coworkers that day in comparison to "tell everyone." These intervention efforts should be built into supervisory training modules, and supervisors should also have their own role model examples at the corporate level to learn how to engage with their employees in the field.

Other research has argued that better intervention instruments are needed that allow employees to observe tangible actions or facts that occur in the workplace and diagnose those instances as a part of continuous HSMS improvement (Podgorski, 2015). The mining industry, among other high-risk occupations, needs an HSMS tool that facilitates workforce development through a process that promotes commitment and involvement. Research has argued that, rather than auditing for compliance, looking at human factors or the relationships between employers and employees provides the foundation for H&S on the job (Fernández-Muñiz et al., 2012). The feedback provided from supervisors in the Acknowlogy mobile app indicated a high level of supervisor-worker engagement daily.

To that end, this study revealed the uses and benefits of deploying a mobile app to foster communication among employees. Specifically, in many high-risk workplaces such as mining or construction, it is difficult for supervisors to objectively communicate feedback about safety performance (Newnam & Goode, 2019). These researchers went on to say that, as a result, communication often focuses on task-related issues such as completion rates. However, it was illustrated in the communication feedback that occurred within the app that supervisors were able to read a workers' individual health or safety assessment for the day and, if opted to, could provide specific safety feedback or offer personal experience related to completing the task safely. Although face-to-face communication likely cannot be replaced, this study showed that supervisors can put in meaningful effort to educate and encourage their employees to complete a task safely from across a worksite, city, or state. Due to the current status of worksites and presence of physical distancing protocols for the foreseeable future, the influence of this communication on worker H&S decisions and outcomes should be addressed in future studies to determine its utility in high-risk industries. However, future research should strive to develop and evaluate the impact of such safety-based applications among the mining workforce.

LIMITATIONS AND CONCLUSIONS

This study analyzed over 2,000 communicative examples from supervisors and how this feedback functioned as a possible leading indicator through the application of SMART principles. By demonstrating the exact, word-for-word communication offered and how it fit within these five principles, practitioners can see what may be lacking in their current communication practices and how to balance supportive feedback with tangible, knowledge-building information on the job. Importantly, this study has implications for using the principles of SMART to facilitate feedback as a valid leading indicator in the workplace. This finding is important as high-hazard industries such as mining and construction are consistently acknowledged as industries where numerous, dynamic risks occur regularly (Phakathi, 2017). These results can be used to improve the H&S feedback offered by supervisors to, in turn, influence the positive execution of H&S behaviors in the workplace. In response, this research contributes to

the body of knowledge around SMART as a leading indicator in high-risk workplaces while adding specific results that could improve supervisory communication both face-to-face and via mobile technology.

Despite the applicability of this study to a variety of occupational sectors, there are limitations that need to be considered with these results. Primarily, the data received was archival and not collected by researchers with this specific intent in mind at the onset. A more precise line of inquiry should occur that digs deeper into how supervisors and workers would define the five principles of SMART to assess any overlap in the existing framework and worker perceptions. Then, collecting additional data with this information, and with the potential education of SMART having occurred, would likely allow more examples of each SMART principle to occur in daily feedback and a better understanding of the value that supervisors may place on each of these five areas of goal setting. Along similar lines, because researchers did not intervene with workers who received the supervisor feedback, we cannot say with certainty that the communication was perceived and executed as we would anticipate from a leading indicator standpoint. Future intervention research should occur around this question.

Additionally, acknowledgement data was analyzed from only one company. Although the sample was large and longitudinal, being able to compare supervisor data across companies would be useful. However, within the current company in this study, several worksites across a number of states were represented. So, it is likely that different worksites had different timelines and priorities for projects, allowing a variety of feedback to be provided over the 3-month period. However, with a limited sample, the study results cannot be generalized to the entire industry.

Despite the limitations, the results were able to take an existing framework, often applied in business, and extend its use as a leading indicator in occupational H&S communication. As employees of organizations, we are often encouraged to set SMART goals but do not apply these principles to our own way of communicating and providing feedback to help achieve those goals. This study applied the principles of SMART differently and found the application of the principles to be adaptable and able to function as leading indicators for encouraging worker H&S performance. Research has shown that SMART goal setting can build feelings of empowerment and facilitate a sense of belonging (Geller, 2002). The current results give reason to believe that receiving communication from a supervisor that is aligned with SMART principles can build similar feelings of empowerment and engagement among employees.

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