Conversations are the New Currency for Operationalizing Culture, Engaging Employees and Improving Planning

Setting the Stage

As you approach the downtown Austin skyline you will see a distinctive building looking down at the Texas State Capital. One day during construction on the 18th floor a pipefitter working for one of our customers opened SmartTagIt and captured a video of him and another pipefitter discussing their daily pre-task plan. A day later their Safety Leader called me excitedly to share what had happened. As we discussed the video and the informal conversation it captured, I had one of those rare epiphany moments.

Clearly, these conversations are essential to how work gets put in place safely. When thousands of these daily conversations are taken in the aggregate across the footprint of the company, I suddenly realized they reveal how well a company’s culture is being operationalized and actualized. They uncover where it is working and expose where tensions exist. This one brief video made me reevaluate the premise that a company operates as a top down organizational system. But how can a CEO do so effectively with so little access to what goes on where the work is done? Today there are no good mechanisms for CEOs to obtain honest unfiltered feedback or visibility to conflicting work priorities and resulting confusion among workers and their supervisors as they engage in jobsite activity. This disconnect impacts productivity and increases the risk of serious injury or fatality (SIF). While the CEO/Leadership sets the vision, values and blueprint that “build” a successful business, it is the everyday conversations at jobsites that connect everything. It is where the ability or willingness to plan, engage, recognize hazards and show real care can be seen in their raw and unbiased form.

For the last 18 years the FactorLab team have been on a mission to help reduce or even eliminate serious injuries and fatalities in the workplace. We started with digital hazards forms on Palm Pilots that went beyond completing paper forms or taking a survey. Our journey next moved into sophisticated predictive models incorporating over a billion field safety observations to prove employee engagement was a strong factor in prediction and positive contributor to company culture. We successfully conducted use cases to establish the importance of everyday conversations. We collected, analyzed, and contextually understood these conversations. But we knew the essence of engagement could only be captured in a real-world real time setting and its ultimate value would only be realizable when we could activate and aggregate individual conversations. So, we had the experience, the data and the analytics, but we didn’t have a scalable answer. Even in successful projects that reduced safety incidents we challenged ourselves to find a way to use these interactions to identify
actionable precursors for incidents as well as potential safety or risk system health failure. This inspired us to develop new ways to visualize and capture this information through real time videos to help an organization peer directly into the heart and soul of their culture. With this visibility, CEO’s would have an unvarnished view into the current state of their culture and be able to develop new metrics to measure the effectiveness of their actions as they strive to improve. The more successful we were in analyzing clusters of video captured conversations, the more we recognized that as the number of conversations grew significantly the complexity and time consumption of doing this would be no longer viable or affordable. This is when we made the transformation into AI and machine learning to perform needed analyses and establish required contextual understanding.

We have witnessed thousands of these informal sessions and conversations between a supervisor and crew through real time videos. The following simple table illustrates what these conversations accomplish and the essential questions they help answer.

<table>
<thead>
<tr>
<th>Conversations Can Accomplish</th>
<th>Key Questions Answered</th>
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<tbody>
<tr>
<td>• Indicate the ability/willingness to discuss high risk hazards</td>
<td>• Do participants know the purpose of the planning activity?</td>
</tr>
<tr>
<td>• Reveal more than words and images</td>
<td>• Are recognition systems healthy?</td>
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<tr>
<td>• Make it transparent people care</td>
<td>• Are leaders equally ready to lead?</td>
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<tr>
<td>• Demonstrate how well they plan</td>
<td>• Is pre-planning just pencil whipping?</td>
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<tr>
<td>• Reinforce confidence in supervisor</td>
<td>• Can you improve systems health?</td>
</tr>
<tr>
<td>• Show the real hazards they face</td>
<td>• How to measure major improvement?</td>
</tr>
<tr>
<td>• Indicate willingness and engagement</td>
<td>• Is there a feedback loop?</td>
</tr>
<tr>
<td>• See teams share and actively listen</td>
<td>• How do conversation impact CEOs?</td>
</tr>
<tr>
<td>• Provide a window into culture for CEO</td>
<td></td>
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<tr>
<td>• Witness systems health at the site</td>
<td></td>
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<tr>
<td>• Test and validate CEO assumptions</td>
<td></td>
</tr>
<tr>
<td>• Force “power to listen to truth”.</td>
<td></td>
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</tbody>
</table>

This paper cites and references 27 different studies conducted by scholars, researchers and leading consulting firms focused on safety, culture, engagement, AI technology and the role of conversations to enlighten and drive change. We analyzed safety research by academics including Dr. E Scott Geller, Dr. Matthew Hallowell, Dr. Jan Wachter and safety focused organizations such as DEKRA. We incorporated the work of thought leaders at
Harvard, Gartner, McKinsey, Gallup, and others centered on culture and the elevated importance of ordinary conversations. This included three breakthrough new studies completed in the last year centered on conversations entitled “Leadership is a Conversation”; “Open Your Organization to Honest Conversations”; and “Three Cultural Conversations Every CEO Must Have”.

None of these themes and concepts are new. The new “aha” is how the pipefitter on the 18th floor revealed for us the untapped role for technology to address the challenge of establishing, monitoring and adapting cultural alignment between C Suite and jobsite through bi-directional connections. We realized it is possible to use a mobile device to capture real conversations in video form and apply Machine Learning techniques to create a previously unimagined visual topography of a company’s cultural landscape. It establishes a system health map to navigate the unexpected and measure progress. With an enlightened, fact-based mental model, a CEO who values unvarnished truth can see where they need to focus and when the walk and the talk are not the same. For the first time this is visible at the top to increase employee engagement and accelerate corrections in the moment and over time.

No time in our lifetime is this capability more valuable than in the current COVID-19 crisis. One of our customers doubled down on the importance of their pre-planning meeting due to the virus. Leadership provided training and measured the impact of which crew conversations changed behavior the most, and which changes had the greatest effect in terms of engaging those closest to the work. It allows management to get a reading on anxiety levels that make it difficult to focus on the work at hand but also increases safety risks. Total cycle time to do all this was under 72 hours. The tool also helps identify gaps in planning abilities associated with the new COVID-19 protocol as this is essential to keeping some semblance of productivity during the crisis.

FactorLab has been able to extract a common thread on why and how conversations at the jobsite matter. That you have them, how you have them and what they include need to fit your organization, its processes, values and culture. How do they operationalize culture and employee engagement? What is essential is that however you address this you must reflect four critical categories: 1.) planning, 2.) engagement, 3.) hazards and 4.) caring. Caring and engagement is where you create a feedback loop and two-way communication as ideas and actions must flow both ways.

FactorLab hopes you will use this paper as a resource guide and as an activation mechanism for your executive team that helps you advance on your organization’s journey. This paper accumulates what we have learned
from experts and visionaries across a range of disciplines and experiences so you can convert them into real world outcomes. We accomplish this through a series of sections and then integrate them into a system FactorLab has developed for use with its customers. Our audiences are the CEO and COO, Safety and Risk Leadership, Heads of HR, Operations Executives, and Technologists whose role is to bring new advances into the company. Most important of all is for the Safety Management and Frontline Supervisors who are the ones on point to seize on theory to save lives.

FactorLab through its SmartTagIt system works with leading construction and industrial companies to experience and validate the innovative technology we are integrating into their pre-planning and other activities. To accelerate our use of math models we are working with the University of New York Buffalo to mathematically and contextually organize jobsite conversations. We are using machine learning and multi-person interaction analysis of individual conversations to identify how the collection of distinct conversation from jobsites across the globe can be used to objectively examine the state of your culture and safety system health. We illuminate tensions or culture hazards that could undermine employees seeking to do their jobs, but lack motivation due to the misalignment of the words on the culture plaque and how things get done at the jobsite. Ultimately it comes down to outcomes. Our customers are experiencing significant improvements in worker safety and engagement levels using FactorLab’s SmartTagIt system. Their unique projects may differ but their desire to transform safety is shared.

FactorLab realizes there remain many milestones for us to reach in partnership with leading companies before we fully achieve our goals of being able to clearly distinguish a top performing from a low performing company. We follow three simple lessons.

- **You know your conversations are not where you want them to be.** Nowhere is culture more on display than during the two minutes in the morning when a team is preparing for the day. We will share revelations from safety experts and academics who have analyzed the relationship between culture, conversations and competitive advantage. World class cultures are defined by how frontline leaders communicate with their people on a regular basis and experienced every day through conversations at the jobsite. They renew, reinforce or test a culture.

- **You are already paying for surveying and assessing safety.** You don’t need a new system or costly process and you can continue to have your employees do what you are doing. Recognize your current approach to conversations is ad hoc because you don’t have a cost-effective way to access and learn from individual workers or aggregate insights to derive deeper contextual understandings.
• **It is possible to do the unthinkable.** You can now model conversations of front-line leaders to drive better safety outcomes. Our work with the University of New York Buffalo poured over 5,000 unedited daily planning conversation transcripts. Using machine learning we collected, distributed and organized thousands of conversations that a company previously wouldn’t have been able to access and measure with new metrics and model. Executives can now observe how their words filter down to those closest to the work. In real time, organizations can see how projects are planned, expectations are set, hazards are discussed, risks avoided, values reinforced and communicated. Data can drive needed training.

**Section 2** examines safety research on reducing workplace accidents and injuries. High performing cultures where leaders engage their teams in effective safety behaviors significantly outperform their peers. We draw on empirical studies on the effectiveness of conversations between leaders and those putting work in place. The best ones are safer, perform better and deliver superior financial results.

**Section 3** describes how to move from CEO aspirational to operationalized culture. These considerations extend beyond matters of safety but apply the same language and organizing principles and are derived from the same conversations. Aligned cultures are real only if the CEO and crew members are “connected and engaged”.

**Section 4** examines three recent reports on the central importance of conversations. They are from Gartner Research, Michael Beer and Boris Groysberg.

**Section 5** covers FactorLab’s own research and completed projects in the field. We describe real world applications of the prior sections tested at our customers. We have drawn on 5,285 conversations collected from 124 worksites over 24 months. We will cover the hypotheses we tested, summarize results and share implications and recommendations. With our data sets and math modeling FactorLab can with over 80% accuracy also classify multi-person conversations in an industrial environment. It is mathematically possible to organize multi person daily pre-planning conversations by the vectors of engagement, caring, planning and hazards to reduce SIFs. The results show real progress on measuring “as is” and “future state” (post-intervention) culture, level of engagement and quality of frontline leadership. It is done with less subjectivity, bias and costly productivity and time delays. We also used human observers reporting on what they saw to compare with the model outputs. These initial findings can help academics in their research designs, safety
experts gain more insights from empirical observations, and leading corporations with bolder safety aspirations implement change initiatives.

We close this section with an observation from Lewis Carroll’s “Alice in Wonderland”. It is particularly timely in the COVID-19 crisis where chaos replaces normalcy, and when top is down, and bottom is up which also applies to operationalizing company culture. When Alice asked the Cheshire Cat “what road do I take?” The cat asked, “where do you want to go?” “I don’t know,” Alice answered. To which the cat responded, “then it really doesn’t matter, does it?”

When it comes to “Looking through the Keyhole at the Jobsite” conversations help identify opportunity to monitor worker safety, and engage and demonstrate care about the wellbeing of those on the other side of the keyhole and at risk.

**Section 2: High Performing Cultures distinguished by how Front-Line Leaders engage with those closest to the Work**

We know Safety Professionals and Operating Executives would watch these videos and learn from them if they could access them. We discovered through field and literature research, there is no agreement among supervisors on what “good” means. We found when we asked ten people to watch ten videos and define which ones were “good” we would get ten different definitions. But more encouraging, we learned a subject matter expert could watch a video and decide in a matter of seconds if it was “good” or needed improvement. FactorLab has developed objective criteria to organize and classify these conversations. To accomplish this, we drew on the work of respected researchers in Human Performance, Behavioral Science and Safety Management. We incorporated their findings into our organizing principles, allowing us to build upon their findings. So what really matters?

- **Conversations matter**- when do they happen, how are they conducted/accessed
- **Discussing hazards matter**- which hazards, how discussed, variation and hazard severity levels, understanding associated risk
- **Planning work matters**- anticipating work through pre-planning is important and enhances productivity
• **Engagement matters**- multi-person conversations more effective than one sided
• **Care matters**- when demonstrated with words and actions caring can avert injury
• **Truth matters**- in unprecedented times, trust is the new currency of organizations

We discuss six highly respected researchers and a major study by McKinsey on safety. They documented what is essential to reduce accidents and injuries at the workplace. While we don’t fully explain their extensive work, we offer a glimpse into how and why their efforts influenced our decisions on how best to organize vital honest conversations.

**Matthew Hallowell**

Dr. Hallowell is a Professor of Construction Engineering at the University of Colorado specializing in construction safety research on leading indicators, hazard recognition, safety risk assessment, and precursor analysis. He heads up CSRA an industry organization supporting research on how to prevent serious incidents and fatalities. Hallowell discovered that **workers are able to recognize only 50% of hazards they will face on the job.** This contradicts the assumption people can always see danger lurking and just need to follow procedures to mitigate hazards. He showed recognizing serious hazards is far more complex. He started a program in precursor analysis to identify presence of known precursors of serious incidents and fatalities through brief, but targeted, conversations within a work crew. He found 16 strong predictors ranging from high levels of schedule pressure to a poor plan for change. With precursor analysis managers can quickly engage with crews to identify presence or absence of specific warning signs of events through structured discussions so that they can take action before an event occurs. Hallowell showed top performing crews receive regular safety communication from management at least weekly demonstrating care and interest from the top. But it is the day to day interaction among workers and supervisors that drive and sustain safety. Open, frequent communication between supervisor and employees differentiates high from low safety performance crews. The greater the number of crew members connected through informal conversations, the better the safety performance. Shared attitudes and behaviors enhance performance and capacity to avoid errors.

**Helen Lingard**

Australia set a goal to reduce worker fatalities due to injuries by 20% by 2022. RMIT Professor Lingard conducted field based empirical studies on supervisory leadership, work safety communication practices and informal crew conversations in support of this. Lingard analyzed network patterns within small groups through site-based observations and listening to informal conversations of supervisors and workers. It provided insights on how the
best supervisors distinguished themselves by linking self-reported safety behaviors and how they adopt leadership practices that influence behavior. Workgroup safety climate was the highest priority of all activities and performed daily. The most important activity is the daily pre-planning meeting focused on relevant issues for the day ahead. They established informal conversations build trust and lack of frequent contact does the opposite. Authenticity is important to workers in how they view their supervisor. They expect supervisor behavior to be consistent with their words. Top supervisors are active listeners as this facilitates supervisor recognition and reward of individual accomplishment which build worker trust. Effective leader qualities are:

- Being organized and planning work in advance to anticipate safety hazards
- Supervisors are a role model when they maintain high standards of safety
- Consistency in approach fosters shared purpose among crew member
- Understanding individual worker circumstances demonstrates caring
- Are responsive to personal issues and challenges at work and home matter
- Eliciting respect through proven experience, expertise and technical capabilities
- Creating a trusting environment in which workers are listened to and respected
- Being able to voice concerns to executives without putting their careers at risk

Bhavana Pandit

Dr. Pandit is a Professor at University of North Carolina Raleigh. He has studied how poor safety communication as it is a widely recognized challenge and problem in the construction. He evaluated workplace factors that foster safety communication and the importance of frequent informal conversations among workers. A company's safety health and the importance attached to workplace safety usually correlate with how effectively and frequently safety information is exchanged effectively at the crew level. Investing in efforts to promote crew-level cohesion and reduce tensions can yield significant safety benefits and higher engagement levels. A synergistic effect exists between safety climate and crew-level cohesion.

E. Scott Geller

Dr. Geller from Virginia Tech has been at the forefront of behavioral research on safety for over two decades. His research is foundational in understanding worker behavior and crew level interactions. He is visionary in the importance of active caring, listening and how trust leads to team cohesion and worker safety. In an active caring culture, people look out for the welfare of others. Behavior-based safety directives alone will not make a difference unless people have the courage to speak up. Culture can reinforce compassionate caring or create
obstacles and tensions. The better employees feel about themselves the more willing they are to care for others. *Crews come together when supported by supervisor coaching and collaborative conversations.*

**Jan Wachter**

Jan Wachter a Professor at Indiana University of Pennsylvania is a highly respected authority in safety management. His area of greatest interest is error precursors and understanding which unfavorable conditions increase probability of human error. Error traps include time pressure, mental pressure, fatigue, being new to a task, distractions, and overconfidence. *He points out human error is a symptom of deeper trouble in safety health which is why organizational weaknesses arise in safety systems.* One can’t plan for, control or defend against all error-prone situations. To believe one can, creates a false sense of preparedness that will only make incidents worse. *Effective tools start with pre- and post-task planning and self-checking “take-a-minute,” and “stop and seeks”* for workers when they do not believe they have the knowledge to make good decisions. These tools engage workers to be situational aware about their safety, hazard avoidance and recognition of conditions surrounding them.

**Joe McGuire and Emily Haas**

McGuire from CRH and Haas from NIOSH have written on supervisor practices where field-based leadership is critical. They show proximity, having more conversations and better overall communication with supervisor can enhance workers’ trust, because it indicates they care about their crew. It also helps workers feel safe in bringing up safety issues and near miss hazards to their supervisor. It breaks tension between doing what is needed vs. trying to justify unsafe behaviors because of tight schedules or fear of retribution. *A staggering 78% of workers have observed co-workers taking short cuts to get a job done and 75% would not raise an issue with a supervisor.* Also 67% observed co-workers disregard safety rules because they are “over-kill” and 61% of employees have seen co-workers in unsafe situations because a lack of training. No wonder *20% have witnessed a severe injury or fatality and just 25% who observe these incidents report it.* It isn’t surprising how little progress has been made in 20 years to reduce SIF. Ways to make improvements are known, but clearly not practiced.

**McKinsey on what distinguishes companies that excel in safety**

A major McKinsey study on the “Symbiotic Relationship between Organizational Health and Safety” involved 100,000 managers and employees from 52 firms using data collected on organizational health and safety. They
demonstrated top tier health companies have the best safety records and identified which practices correlate closest with superior safety performance. Companies with good safety records outperform others on health factors such as innovation, a focus on outcomes and ability and desire to learn and continuously improve. Engaged employees identify hazardous situations more frequently and accurately and propose solutions to mitigate risk. They also raise individual and group awareness, lower the tolerance for risk, and improve quality while reducing costly rework.

*Top quartile firms in organization health, 6X fewer safety incidents than bottom and bottom also have 3X as many incidents leading to lost work time as top tier*

McKinsey showed that change programs to improve safety, can succeed only when employees see their leaders as authentic. Supportive leaders create learning cultures essential for improving safety as they encourage employees to speak up and share their concerns. None of this can happen without CEO support. Successful actions predictably include habit-reinforcing incentives. Companies with high safety standards focus on soft practices encouraging employees to own safety problems and leading to solutions.

One view shared by McKinsey and FactorLab and others is the importance of daily pre-planning conversations. When done properly they raise awareness of hazards, impact mindsets, and encourage team leaders to look at what needs to be done to reduce unexpected events leading to serious accident or injury. *Conversations reveal much more than as they are windows into company culture, values and system health*. But it only happens when frontline leaders engage their employees. Examining large volume of conversations observed over time, you can create a cultural health heat map to help senior leaders visualize the impact of the many decisions made in the field daily. The bar is high as 75% of pre-task plans are read to a crew or just a piece of paper.

**Dodge and CPWR**

They examined factors contributing to safety and the top ones relate to the frontline supervisor. They held informal safety planning meetings and frequent conversations with their crew. An extraordinary boss brings out untapped talents and heightened awareness in a virtuous cycle where people do more because they believe more

- *Top supervisors spend 70% of work time in verbal interactions with crews*
- *71% of workers urged by top supervisor report incidents vs. 6% at worst*
- *50% of best ask for worker input on safety conditions, only 8% among worst.*
FactorLab has found these research findings to be highly consistent with our own set of over 5,000 video observations of supervisors and their crews engaging in conversation. It is the daily conversations that increase preparedness, confidence and commitment.

These videos also show when teams care, trust each other, and collaborate. We have worked in large corporations in senior roles as well as created successful technology businesses. We have worked at the construction site closely with some of the world’s leading companies in the world. We have learned how the best actualize their cultural imperatives. We see how the work we are doing at FactorLab can inform and advise companies on culture, worker engagement and mindsets. **CEOs expect workers to be informed by culture when often culture must be informed by workers.**

**Section 3: Consultants, Generals, Coaches agree the Heart of Culture and Engaged Employees is through Conversations**

Much has been written about connecting and cultivating culture, yet no one seems to understand it, especially the employees who are asked to live by it. Unlike strategy where one can define, articulate and prioritize activities and execute them operationally, culture is more abstract, amorphous and at times disconnected from the real world. There are many longitudinal studies and annual surveys conducted by senior leadership to gauge and measure culture. One area of importance is employee engagement as engagement is what fuels culture. One of the limitations facing CEO’s is that the most impactful conversation on culture aren’t in the board room but out of sight at the jobsite.

*6% of executives see employee feedback direct from where work is performed.*

Given this, it is not hard to understand why, surveys, periodic site visits, or employee sensing sessions do not provide feedback in an unvarnished way. The inability of a CEO to connect with what is most important is often disconnected from what he or she believes governs people’s behaviors individually and as teams. The fact that only 1 in 16 CEOs have this type of information readily available is why FactorLab is proud that for the first-time
senior management can evaluate whether the company culture and aspirational messages and the day to day work environment and worker mindsets are aligned through videos capturing honest conversations. Where are the disconnects and tensions that confuse, demotivate, frustrate employees and put their safety at greater risk? Gone unnoticed can these issues impact one’s ability to retain key employees. If these jobsite realities are not communicated to CEOs is there a false sense of security? If truth is afraid to speak to power, why will anything change? In this section we cover major themes that helped us prioritize where our technology could be most impactful.

**Gallup**

Gallup is one of the most prominent firms in employee engagement and its relationship to culture. For over two decades they have measured and tracked the engagement of 27 million employees and more than 2.5 million work units. Little has changed over time.

*Less than one-third of employees are engaged in their jobs. Greatest discrepancy of highly and disengaged employees is in worker safety with a difference of 70%.*

This defines a yet unsolved challenge most CEOs face. If a highly engaged organization starts at and builds up from the individual and crew level up, how can executives better understand what occurs during these informal conversations with their supervisors? Once they recognize it can’t be decreed from the top, most CEOs realize they lack the data and insights that would help them identify cultural tensions, hardened mindsets and resistance to change.

**McKinsey**

McKinsey has examined culture closely as it sees it as central to a company’s Organizational Health and Financial Performance. This is based on research on 1,000 firms involving 3,000,000 people. Becoming a top quartile culture is hard to achieve. Why? *Only 12% of employees understand their culture especially as it relates to them.* Surprisingly, 70% of senior executives see culture and company strategies as disconnected and not mutually reinforcing. One likely reason *is 83% of CEOs talk the culture, only 33% of them behave consistent with it.* It is even smaller when you try to tie operations and culture structurally. Only 19% of CEOs manage ops and processes by their culture. McKinsey has shown
Top quartile cultures have 60% higher financial returns than median ones and are a staggering 200% higher than bottom quartile cultures.

John Wooden and Stanley McChrystal Coach and Leader Insights

Addressing culture and engagement has major payoffs beyond the workplace. John Wooden the most successful basketball coach of all time used to tell his players “be quick but don’t hurry”, because he was incredibly intentional about building the right culture. He knew which behaviors, skills and efforts would strengthen and sustain excellence. He led by example, recognizing he was first a teacher and mentor. To convey caring about his players he needed to be involved in their lives. This extended well beyond college, and in some cases for the rest of his life. So much of this was achieved through frequent communication and ongoing team conversations. He knew great teams won championships, not great individuals. (same applies to a crew). Coach Urban Meyer put it simpler. “Leaders create Culture → Culture drives Behavior → Behavior produces Results → Results drive Winning, but it all begins with Culture”.

Gen. Stanley McChrystal has written extensively on leadership and his book “Team of Teams: New Rules of Engagement for a Complex World,” is one of the top books on engagement. His insights are lessons he learned commanding Joint Special Operations during Iraq War. Today he advises leading companies and is a professor at Yale. The defining qualities of his leadership system include:

- Give small groups the autonomy they need to innovate
- Do this so they can share what they learn in their team across the organization.
- Talk often about shared goals through ongoing informal conversations
- Value every interaction and exchange no matter how small
- Motivate, recognize, reward the team, so each individual has a stake in success
- Every conversation leaders’ have, provides insight into a person and their needs
- Don’t hide from your mistakes, admit mistakes and take accountability
- If you cut corners or hold back it can permanently reduce trust in their superior

Great teams and crews working together, perform better, engage more and are safer than ones where everyone is focused on their own individual needs.
Conversations are special because they tie everything together. Three recent reports highlight the importance of conversations to culture, and how to operationalize it:

- “Three Cultural Conversations Every CEO Must Have” (Gartner Research)
- “Open Your Organization to Honest Conversations” (Beer of Harvard)
- “Leadership is a Conversation” (Groysberg of Harvard)

All three acknowledge they lack the math modeling expertise needed to bring their compelling findings on conversations into the workplace. FactorLab believes it can build on our technology platform to help interpret individual and multi person conversations among supervisors and crews. We can also analyze and aggregate them across thousands of conversations based on planning, caring, engagement, and hazards.

**Gartner: “Three Cultural Conversations Every CEO Must Have”**

CEOs increasingly recognize that a high, performance culture can provide financial and organizational benefits. For this reason, many CEOs are trying to operationalize culture. But they struggle to figure out how to do this because most companies have little real-world evidence of how well their employees are performing. Gartner believes CEOs must engage in three conversations with HR Heads for culture initiatives to succeed. But, only **10% of HR Heads believe their CEO understands the “real” culture.**

- Define your culture as a set of tensions, not attributes.
- Listen to employee unfiltered feedback to uncover the true culture.
- Embed culture leadership into business leadership

Operationalizing culture addresses existing tensions more than workforce attributes. The organization must identify where tensions exist and work with employees to resolve them. Listening to employee’s unfiltered feedback, allows senior leadership to uncover the true culture employees live by as they perform their tasks. The issue in worker conversations is that most employees don’t know why the desired culture is needed, or those that do, don’t always buy into it because it is not adequately reinforced in informal conversations with supervisors. Since CEOs don’t have access to unvarnished truth, they do not recognize the disconnect. High
levels of tension between business walk and cultural talk are further magnified. Gartner identifies three major gaps including knowledge, mindset and behavior. There is a knowledge gap for 69% of employees where the culture exists as an idea or intangible, so the workforce does not believe in it. A mindset gap impacts 87% of employees. While they may buy into what they think the culture is, they don’t understand how to act according to it. Finally, a behavior gap effects 90% of employees. Here employee actions seem aligned with the culture, but workers don’t believe in it, so even if they are compliant with it, they don’t engage.

Most efforts target the best performers hoping that if they adopt the culture others will follow. But how do you know who the “top” performers are when you have no access to critical information? Even then, you still need to engage the entire workforce. Gartner suggests asking the following questions. What are the most troubling tensions that exist in our culture today? Which tensions are vital to the culture going forward? How do we help employees navigate tensions? The most difficult of Gartner’s conversations is getting CEOs to listen to their employees unfiltered truthful feedback. CEOs often do not want to hear about what isn’t working, and most employees do not want to be bearers of bad news. Armed with this, CEOs should urge leaders to listen more closely to people in the field. Gartner see progress at high performing companies as they move from a culture centric view of leadership to one focused on commitment and execution by business leadership. Once you operationalize culture you can hold leaders accountable. But change will only occur when CEOs make it clear this is a top priority and not just something to do when you have time.

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<th>Behave</th>
<th>Operate</th>
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<tr>
<td>% of organization leaders consistently do this activity</td>
<td>83%</td>
<td>29%</td>
<td>19%</td>
</tr>
<tr>
<td>% impact on workforce culture alignment</td>
<td>1%</td>
<td>9%</td>
<td>18%</td>
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FactorLab’s use of machine learning and math modeling helps interpret field information to be acted upon by the CEO. No more based on speculation or anecdotal evidence

**Michael Beer: “Open Your Organization to Honest Conversations”**

Michael Beer has been a visionary in understanding organizations and leadership. His “truth speaks to power” message has resonated with many as it gets to the heart of connecting culture at the top and on the ground. Beer has written a new book entitled: “Open Your Organization to Honest Conversations”. The book reinforces the basic premises that have guided FactorLab in its technology development and understanding of conversations at the jobsite and implications for worker safety. Low level employees who put the actual work in place are fully aware of the problems that plague companies and reasons why particular initiatives don’t work. But jobsite
workers remain silent as they fear speaking up could put their careers at risk even if the hazard might threaten their own physical safety and that of their crew. Beer calls this a “cyclical organization incapable of change or improvement”. Stress and mental fatigue cause workers to be disengaged and lose trust in their organization. Their reluctance makes them passive and lacking the trust needed to collaborate with others. Beer believes an antidote is having organizations share critical information freely and frequently from the jobsite to the top executives. You have to get your best people involved in finding ways to get candid feedback from employees before attempting any organizational or culture centric changes. CEOs have to make themselves vulnerable asking workers and frontline supervisors to speak the truth about what is and is not working. Management failures are rooted in an inability of executives to learn or accept the truth and respond to it. What was once viewed as career limiting needs to become information sharing to elevate performance of the company.

The worker moves from traitor to creator as you realize you need honest conversations involving the exchange of two truths intersecting from top down and bottom up. That workers can speak openly in and of itself is a major advance in connecting culture and behavior because it communicates authenticity, caring, and a commitment to drive change. It must align with company strategy and values to be effective. Management practices must enable employees to satisfy their personal needs for meaningfulness in their job, to feel a sense of fairness and being valued. An organization must have the capabilities to support honest and open conversations about how well it is adapting to changing competitive or social forces and realities. It includes upholding values espoused by CEO no matter the challenge. The COVID-19 pandemic demands this. Dan Coyle in his book “The Culture Code” conveys many of the same messages about creating a culture where people feel “safe”. This means modifying traditional practices to address the inherent threats in the COVID-19 crisis and its impacts on all aspects of a person’s personal and professional life. For example, practices where people are in a circle in close physical proximity and in physical contact with handshakes and first bumps, must be changed and people’s behaviors adjusted. But even with separation, they still need to continue to interact and have conversations and sharing with each other. This will require more active listening.

**Boris Groysberg on “Leadership is a Conversation”**

Groysberg examines how one can improve employee engagement and alignment in today’s flatter, more networked, and digitally connected organizations. Technology opens up new ways to create value and interact with customers and employees. The advances run in the face of hierarchical, command and control leadership models. For disruptive changes in how a company is managed, communications are vitally important to connect workers in the field and management on a cultural plane. Groysberg points out this can’t come from HR. It has to be conversational and from the CEO. Goysberg interviewed hundreds of executives. They conveyed explicitly
that having frequent real conversations with their people matters. They shouldn’t be formal or rehearsed. They are unstructured and occur spontaneously. They must become the norm in how people interact with their supervisors and among themselves. **Once the hierarchical approach is abandoned as the prevailing mindset, the culture becomes the sum of many informal interactions people have throughout the company each day.**

Because physical proximity between leaders and employees isn’t always feasible, mental or emotional proximity becomes essential in high performing companies. Groysberg identifies four major elements of organizational conversation that are essential attributes of interpersonal conversations. They are intimacy, interactivity, inclusion, and intentionality. Leaders who lead through conversation-based practices need not excel at all four, but the more of them they do excel in the greater the improvement as they can be mutually reinforcing.

Intimacy is how workers get to know and trust each other as they start to listen to each other. Company communications are no longer top down decrees, but a bottoms-up exchange of ideas. **Conversations are less about issuing or taking orders, and more about asking and answering questions.** Gaining trust is the heart of intimacy and listening is so important because if you never listen to each other how can you together advance initiatives or address problems. Listening also reflects respect and humility. Interactivity is about encouraging and promoting dialogue through jobsite conversation. When leaders seek out employees to engage in conversation it increases engagement. A truly interactive culture includes values, norms, and behaviors that encourage and stimulate natural conversations that reinforce the values themselves. Inclusion expands the role of individual employees and spurs personal ownership for things important to the CEO. Much content comes from the field not top executives. It strengthens intimacy and interactivity. Intentionality captures the energy and activity created by the first three and converts them into plans and roadmaps to achieve these goals. It is where process and people come together. What distinguishes intentionality is the other three are about opening up things through conversation. Intentionality brings closure and integration to the process and is more about actualizing high purpose activities into day to day work. It is where a big picture view and what it stands for becomes relatable to each individual.

FactorLab’s research supports the authors central findings. Our technology platform is being used in the field by organizations to bring honest informal conversations into their work environment in ways that engage employees. They build caring relationships, and collaboration with their supervisors and colleagues. Video captured conversations can be experienced one at a time by management or aggregated and contextually analyzed for deeper understanding. FactorLab has been able to collect and analyze videos of conversations in unprecedented ways. Our math models identify where to place emphasize, evaluate progress, work on bottlenecks, and integrate it all into actionable reports. We have shown high scoring conversations do correlate with high performing frontline leaders and top quartile supervisors are more effective in connecting and engaging crew behaviors and mindsets.
Section 5: FactorLab Examples and AI Models to Understand and Address Precursors to Accidents and Risk Mitigation

FactorLab’s SmartTagIt technology platform is being used in the field by over twenty different organizations ranging in size from a few hundred million to several billion dollars in revenue. Our focus is primarily on organizations that either procure or deliver large capital-intensive projects, which tend to have large labor components. We are seeing CEO’s across a spectrum of industries wanting to have easy access to what is occurring at the jobsite every day in real time. It is the most effective to guide company operations out from the abyss of the COVID-19 crisis. COVID-19 is expanding the ways FactorLab can help companies right now and includes engendering trust from their employees when workers are naturally focused on themselves, their own safety and job security. CEO’s are faced with difficult, often uncharted, dynamic choices, occurring when their ability to make the right longer-term investment decisions has never been more difficult and the margin for error never so narrow. Uncertainty is pervasive in the company, at their customers, their supply chains and at the consumer. But most of all it is working with employees as they perform their jobs under unprecedented conditions. Safety may still be the top priority, but added pressures placed on workers to perform during the COVID-19 crisis makes them vulnerable to both. This is not to say they can’t overcome these obstacles and position themselves for future success. The best build on a culture that flexes to new realities but doesn’t bend on the vision that has guided them. New programs succeed only when employees see their leaders as authentic. By promoting their safety as a core value, leaders create and reinforce commitment.

FactorLab’s SmartTagIt Technology Solution Overview

FactorLab was founded ten years ago with the intention of helping organizations use technology and data science to solve the most vexing human centered challenges in the workplace. Our focus has been on how organizations and the systems they employ impact performance of individuals in the field. Our technology is a powerful multiplier by removing constraints and overcoming prevailing mindsets that impact front line leaders and those closest to the work. SmartTagIt is a unique SaaS product of interconnected applications, technologies and data science models. Our team is laser focused on helping organizations who are genuinely committed to
protecting the safety of workers. Users of SmartTagIt see dramatic improvement in field engagement with their critical safety systems. Using SmartTagIt is more akin to using Instagram or Slack than a typical mobile application, making it easier to access information and provide feedback to create a positive virtual cycle of engagement. This is compared to filling out forms that fall into a digital abyss as they provide no deeper understanding or motivation.

FactorLab has collected massive amounts of conversational data from thousands of conversations captured and analyzed in videos of supervisors and crews at customer jobsites. *Our analyses focus on planning, caring, engaging and hazard avoidance. We have conclusively demonstrated that high scoring conversations correlate with high performing frontline leaders.* FactorLab is helping improve pre-planning conversations to save time, put more work in place, and significantly reduce accidents and injuries. We are also the first available safety application using video to communicate at risk situations, positive safety behaviors, provide operational context, and encourage best practices through informal conversations. Video animates in an experiential sense what is occurring during a conversation far better than disconnected static snapshots. We are able to transcribe the text of conversations by video processing these unstructured transcriptions using AI and Machine Learning and creating an array of next generation structured metrics. Armed with a combination of raw data, unstructured video, and more meaningful metrics, organizations can uncover the real driving factors they can control. Models provide added capacity for workers to respond and avert consequences of an unplanned negative event. The impact goes beyond incremental improvements. By using machine learning we can open the aperture to insights not available before.

FactorLab is also introducing a unique approach to prediction. New metrics when combined with other system health measures can be used to predict operational and safety system health. We work with our customer’s data science team to leverage our infrastructure and tailor it to their most critical needs. Our philosophy is the more minds we can have focus on these difficult problems the better the outcomes. Rather than building proprietary models, FactorLab provides building blocks that organizations can use to accelerate their own exploration to meet deployment requirements and develop their own tools and product enhancements. Experience has shown *when you make a process or system easier, people engage more and when more people engage, organizations get a more realistic and unvarnished picture of their current state*, and previously hidden gaps become visible. Partnering allows us to develop a deeper understanding across organizations and guides us in our future research efforts. For example, a better mobile interface cuts the time to collect and share a PTP by 50-75%. By making a form “smart”, organizations can convert a 15-minute paper filling process into a high quality, actionable document completed in one third the time. Just think if one saves 5 minutes a day for 1000 workers
(even if an organization only uses half of it productively), they are getting a free man-week of productivity each day. In these trying times an extra week helps makes a difference when COVID-19 has forced headcount reductions. Anything improving performance, productivity and safety a no brainer.

**Examples of FactorLab SmartTagIt Customer Accomplishments**

FactorLab’s goals relative to these conversations is simple to state and hard to achieve.

1. Provide our customers a reliable, data driven, objective way to classify thousands of conversations along themes that have proven to not only indicate a healthy conversation but can be extrapolated to a healthy interdependent culture.
2. Give the organization a new lens that accelerates how everyone in the company looks at and measures engagement on a daily basis and how to improve it.

Too often front-line leaders still read off of a piece of paper every day to their crews while the crews pray for the meeting to be over. Why are crew leaders reading off the piece of paper? It is because they think they are supposed to even if they know disengaged workers are just “listening” until the supervisor is done. Imagine though if a management committee and operations leadership could personally participate in and experience these daily conversations, they would see things differently and understand what is missing and why that matters. Executives are too far removed physically and emotionally from what happens at the site. Consequences of this during COVID-19 only magnify the situation. *Organizations don’t need to fix employees they need to fix broken ineffective systems* to operationalize intent of their overarching culture.

**Inform those closest to work rather than over “forming” them**

FactorLab worked on a project with Lorenzo, a caring thoughtful guy who does his PTP every day. He fills out a form, looks it over, grabs his people and reads it to them. When done he has them sign a form and give it to the General Contractor. In spite of this, he and his team had a series of eye injuries. Welders were forgetting to clear metal shavings from face shields before lifting them up and shavings were falling into their eyes. Clearly experienced welders knew of this risk and had been trained on how to avoid this issue, yet they didn’t act accordingly, and preventable accidents occurred. When the GC introduced the SmartTagit concept to Lorenzo he was puzzled because he did not believe he had a problem. He believed the eye incidents were just accidents and his pre-planning process was fine. He agreed to try SmartTagIt using it to capture conversations. The safety
professional sat with Lorenzo to watch the conversations and it led to a small tweak to Lorenzo's approach. He simply should ask the team questions about the daily hazards, rather than just reading a form.

- The videos showed the activity went from monologue to a conversation quickly.
- Crew members were smiling, engaged, doing their best to think about hazards.
- They thought more about their face shields and being more careful.
- There were zero incidents for the rest of the project for any of Lorenzo’s crews.
- Lorenzo’s teams went from being behind schedule to getting caught up.

Do we believe that recording a video of their PTP conversation is the singular reason for this potential improvement? Absolutely not, but we do believe Lorenzo’s team was more engaged than before and having more conversations about the work put in place.

**Structure Tone Southwest motivates and recognizes the behaviors that drive fewer incidents.**

Most Safety Professionals get into safety to make a difference in the lives of those that they touch. Finding time to do this is never easy no matter how much they care. Too often they are pulled in many different directions ranging from selling to new customers, to completing audits, inspecting a crane, or explaining how to safely perform complex tasks. Rarely do they get a chance to coach young foremen. The Structure Tone team led by Dan Saddler invited FactorLab to a workshop for future superintendents. Dan explained the FactorLab workshop would show how they could be better coaches by improving planning conversations. The room lit up as they saw that with a little practice on how to leverage conversations, they could look at their safety system with a fresh set of engaged eyes. It would also build on StructureTone’s core values and reinforce their adherence by these young engineers. It’s how a leading organization creates capacity for systems to address inevitably unplanned events. The cost of this realization was nothing, the payoff and return on caring was priceless.

**A Little Caring and Recognition Goes a Long Way**

We all love gift cards. Workers especially see them as a recognition for a job well done. One of our customers videoed a project superintendent giving out a gift card at a staff meeting. The recipient was a Hispanic concrete-foremen who was rewarded for getting his crew engaged. It was the first staff meeting in twenty years someone was rewarded for a PTP. One reason it doesn’t occur more often is there is no definition of “good” that defines when a reward should be given. This video gave them a benchmark for what “good” looked and felt like. When I
asked the team if the Superintendent spoke Spanish, the reply was no. I then asked if the foremen did the PTP in English or Spanish. He did it in Spanish, so I inquired how he could pick the winner if he doesn’t know what he is saying. They replied it is so easy to understand when you watch the video because you can tell regardless of language how actively they are engaged in a conversation about the hazards and the work. The crew was successful in getting someone who does not speak Spanish to watch his video and witness caring and engagement. This of course would not be possible to communicate on paper. The moral of the story is having a PTP video shared among a business unit or region is shared recognition idea, and it is free.

**New Safety Metrics and Mindsets at a Leading Mechanical Contractor**

A leading mechanical contractor invited FactorLab to present on the Future of Safety Metrics to their executive team. The company has an incredible culture and is well along the journey to developing an interdependent engaged workforce. Everyone does their PTP daily and they have developed a digital application to capture and report on PTPs. But after we introduced SmartTagIt to safety metrics, they expressed real excitement because they saw a 10X bump in engagement. When we discussed how to improve the conversations associated with their PTP, you could see the light bulbs come on. Yes, they had a PTP safety system and strong engagement in it, and yes, they care and want their culture to flow down to those closest to the work. But it never occurred to them that they could easily access and experience a video of all their conversations between the crew leader and crew. They realized they could use conversations to take their culture to a higher level. In minutes, they came up with an action plan, made real time decisions and began to imagine new ways to help their employees work together. At the end of the meeting, one executive looked at me and said, “I had no idea I could do so much to help and that it is my job to remove the barriers to helping our employees improve our critical safety system.” He can operationalize culture and worker safety.

**Using New Lenses to Understand and Act on Everyday Conversations**

Recently, I was talking to a board member of a multi-billion, dollar company about what customers really care about when pitching for large capital projects. My hypothesis was that these large multi-nationals put a high priority on safety in these presentations. He indicated that I was wrong. He estimated only 20% really cared and put real value on this topic. The other 80% did but not so much. Why is this? FactorLab believes it is the disconnect between stated corporate culture and values and what really happens on a day to basis where work is performed. I described how we organize conversations and how he could examine a cluster of conversations for each trade partner organized by levels of planning, hazards, engagement and care. He picked up quickly on
the planning part and how he could show a prospective customer how their team could distinguish among different contractors, the good planner from one not as good at planning. We could analyze construction outcomes and see what “good” conversations look like, why they result in less rework, or got more done with fewer change orders. The enormous possibilities and benefits to analyze and use conversations became clear to the board member. It was bounded only by one’s imagination. He could use videos to compare conversations from different organizations and identify ones who have less accidents with ones that had more accidents and explain why. Nothing else needed to change; no new data, no new models. All we were doing was looking at the same conversations through multiple new lens to unlock new insights. Often safety is viewed as a GC problem and responsibility, not that of others involved in a project. But there are wider benefits in productivity, risk reduction and avoiding issues that could slow the project or cause budgetary issues. As safety mitigates risk its importance is significantly elevated for all parties on any given project. FactorLab is pleased it can assist its customers in deriving broader bottom line benefits. The message was received by the board member.

Learnings from our examples and applying insights to your organization

It is time we accept the challenges and move beyond paper forms to captured conversations. The good news is that organizations don’t have to throw out the baby with the bath water. Currently used metrics are still valuable, but they aren’t sufficient given the magnitude and complexity of the challenges which companies face. If their systems, processes and leaders are at such a state that they can’t get workers to wear PPE or Fall Protection, then it should not come as a surprise that those jobsites are at risk. For organizations that are farther along the path of getting the “basics metrics” in place prediction only gets exponentially more difficult. Not to mention the challenge of knowing what levers to pull when a site is predicted to be more at risk than another one.

There are a couple reasons for this. There are fewer incidents to predict and people are already doing the “basics”. Yet, tragically and despite significant investment and best of intentions these organizations still have terrible accidents and injuries. Much has been documented in research on human error, behavior science and human performance. They show organizations need to move beyond measuring percentage safe or unsafe or if someone filled out a form. They acknowledge how difficult it is to measure what is most important; quality, planning, engagement, culture, conversations, system health, and safety management. Because something is difficult does not diminish how important it is to find a better way to measure these vital factors. It only magnifies it.
FactorLab encourages our customers to build models to predict the impact on behavior when a certain intervention is put in place. These models inform leaders of expected behavioral outcomes when they improve the health or capacity of their critical systems. Why don’t organizations measure the efficacy or predict how a certain communication or training approach actually impacts behavior? It is time to move from sites first to insights first, from risk quantification to risk mitigation, from conflict to collaboration, from bottom tier performance to bottoms up top tier performance. We strongly suggest shifting the focus of prediction from asking which sites are more at risk to first better understanding which systems and procedures are more at risk and then identify which specific sites are most at risk. While it makes sense to want to predict which site is more likely than another to have an accident or injury, that does not mean it is the best place to invest your prediction dollars. Here are a few reasons why:

- Serious Injuries and Fatalities are incredibly difficult to predict.
- They are so infrequent the target variable is small and hard to get enough data
- Factors of such an event are incredibly complex and hard to control
- Research has identified factors within your control to help prevent terrible things

This is why we suggest focusing on predicting how planned organizational investments (training, people, leadership, internal communication...) will impact your culture and your organization’s willingness/ability to engage your critical safety systems. This means be better at investment decisions in activities, people and systems that improve the quality of conversations between crew leaders and those closest to the work.

**New Safety Metrics to Make and Measure Progress on Key Factors**

At FactorLab we think a great deal about measurement and metrics and how to improve them. We have had to change our own conventional views on data. We now think of video as a source of data and data as a source for modeling conversations. As such when we watched the video of the team in Austin (as well as hundreds of other ones in person or on video), we recognized these videos as a new and powerful source of data. They unlocked what is generally invisible and we learned why they are indispensable.

The video itself is the data we have coveted for so long. if you use a machine to deconstruct videos it can be turned into hundreds of new metrics directly derived from the conversations in the video. They capture words, reveal body language, show interactivity, and provide insights into capabilities of frontline leaders.
FactorLab has been on a crusade to understand why capturing and analyzing these conversations is so special. It is because conversations can be broken into features that provide objective measurement. One can view them specific to particular areas such as care, planning, engagement, and recognizing hazards and then assign for each specific value. They also reveal a leader’s willingness to get the team involved in conversations on how well the person leading the team planned the daily work and communicated it. Seeing these videos also instinctively demonstrates if a leader cares about the team’s wellbeing. If there is genuine trust for each other they the crew will collaborate more.

Nowhere is the impact of videos than in the pre-planning most companies perform. Here is where the window becomes the mirror. At first it might not be what you want to see, however, it is exactly what you need to see in order for you to make these sessions meaningful and not a waste of time. You can tell people to improve conversations, but it is far more effective to show them how important these conversation videos are. To do all this you will need two new sets of safety metrics. The first allows you to see how conversations tie back to individuals and projects to know what "good" conversations look like. How well do they line up with people you trust to deliver high quality work and avoid accidents and injuries? The second set of metrics allows you to more broadly visualize your culture, values and system health. With new metrics and videos, you can see how well your investment in people is progressing. We at FactorLab can provide a way for organizations to use raw data in real time. The idea of having a library of real people having real conversations, finally allows organizations to see with their own eyes what is working and what they need to improve. Managers can watch as many videos as they desire. You can look at a few, get feedback and decide if you need to see ten more or a hundred more videos to determine if the feedback is generalizable.

**Machine Learning and AI Models to interpret and advance Safety initiatives**

FactorLab has operationalized a model focused on the four themes of engagement, care, planning, and hazards. Essential attributes of each are indicated below.

<table>
<thead>
<tr>
<th>Category</th>
<th>Key Questions</th>
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| Care     | • Do the conversations reflect trust?  
          | • Is the dialogue creating or reducing capacity for unplanned events?  
          | • Speaker demonstrates genuine interest in conversations or people? |
| Engagement | | |
|---|---|
| Is there any indication speakers care for one another? | | |
| Is this a monologue or dialogue? What kinds of questions are asked? | | |
| How many people are participating? How much are they engaged? | | |
| What level of collaboration are we seeing? | | |

| Hazards | | |
|---|---|
| What kinds of hazards are they talking about? Are they real ones? | | |
| Who and how many people are talking about these hazards? | | |
| How likely they report near incidents, unsafe conditions or behaviors? | | |

| Planning | | |
|---|---|
| Are expectations being set? Talking about the work or only hazards? | | |
| Does everyone understand the expectations for the day? | | |
| Do multiple people ask questions about the work as well as hazards? | | |

There are two critical initial approaches that we believe have a significant impact on an organization’s ability to reduce the risk of a SIF and improve operational effectiveness. The first class of metrics can be used to help individuals and crews better understand the organization’s expectations relative to the pre-planning activity. They can use the information to create additional capacity in the system to tolerate an unplanned event. The second class of metrics is to improve culture, values and operational systems that impact crew leader’s likelihood to improve the health of this system. Just imagine the almost unlimited possibilities if you had access to thousands of conversations. With thousands of conversations patterns do emerge and hypotheses are formed to be tested on the next set of thousands more conversations. Some might have lots of caring and but little time dedication to engagement; others weighted more towards planning. We now have new metrics to combine with existing metrics allowing us to predict safety outcomes differently. These new metrics of systems health open up opportunity to mix and tailor safety metrics. These new metrics allow organizations to see much more granularly how crew leaders talk to those closest to the work. They are proxy indicators of how your current values, culture and systems influence conversations and inform executive teams on who they hire, how they lead and where to invest in operational systems that prevent injuries and improve productivity. Even if you magically knew exactly what you wanted from a conversation and could measure it, would people start doing it? The answer is probably not as much as you would like because many factors influence behavior even when people have required knowledge. If you want to improve conversations among supervisors and workers, you must clearly let them know what you want, and address factors influencing the ability to have conversations you desire.
Use of ML to understand and address pre-curser to accidents and Injuries

Advances in Data Science provide solutions to industry’s greatest challenges such as increasing productivity, overcoming cost/schedule overruns, risk mitigation and making quantum advances in worker safety. But limitations are recognized when it comes to leading indicators and actionable pre-cursor metrics. Advancement in understanding unstructured information as a compliment to observation processes are occurring. As experts better understand these areas you can refine current practices to eliminate data collection of little value. AI applications are starting to get the attention of CEO’s in addressing these complex problems. A recent analysis by the International Data Group predicts digital data will grow from 33 billion terrabytes in 2018 to 175 billion by 2025. Noteworthy for FactorLab’s technology roadmap, much of the growth in digital data will not be in highly structured form but unstructured formats like we capture in video conversations. Video, audio and text free will be 80% of the gains. Also 75% of work activities will require natural language understanding and achieved through automated methods will be essential and over time indispensable. IDG projects that nowhere will one see greater attention focused on than risk and injury reduction. Thrust will be in understanding pre-cursers and multi-party conversation.

Partnering with University of NY Buffalo on Machine Learning Models

We have spoken about the advances in data science and its application to worker conversation and representing individual words it contextually terms. But there is much more to understanding this because when you watch and listen to a conversation a human’s brain is unconsciously doing many things at the same time. Your brain figures out very quickly if there are multiple people paying attention. It can determine if the person speaking sounds like they care or not and also if people receiving information are engaged or wish they were someone else. Because your brain understands context, it can look at the environment and make judgements about a conversation’s relevance. The technical and modeling questions FactorLab needed to address include teaching a machine to organize tens of thousands of conversations in a way that would be actionable in the field. This
provides a glimpse into the cultural mosaic executives must understand, which is an area needing to be
explored and dependent on sophisticated math models and machine learning. We have been working with
hundreds of field teams to perfect how to collect, distribute and improve the daily planning activity.

To accelerate and deepen our exploration of advanced modeling we established a partnership with the
University of New York in Buffalo. We wanted to ensure we would be exploring with academic rigor
breakthrough applications of ML models to objectively classify jobsite conversations on our four cultural and
safety themes. The research was conducted over a seven-month period from November 2019 to May 2020. It was
led by Dr. Rohini Shirhari and involves three of her students. The team independently analyzed 6,342 pre-
planning conversations from six FactorLab customers that were managing over 100 different projects with over
50 front-line leaders. The goal was to develop a ML model that accurately classifies conversations and can tie
them back to highest performing leaders at various work sites. They were collected and aggregated using the
SmartTagIt safety management application. To minimize bias, participants conducted normal activities without
any predisposition or exposure to relationships between conversations and how they may reflect the culture.
Each leader used the FactorLab application to collect daily pre-planning conversations in real time as they
naturally occurred. All information provided was anonymous. Each conversation was broken into over 100
features and modeled accordingly. Neither FactorLab nor the customer edited any of the actual conversations.
In our field research we addressed the problem of mining finer details in conversations involving multiple
speakers in interactive exchanges. We used a hybrid system for holistically assessing the health of team
meetings at a construction work site mining an ensemble of domain specific features. They included intensity of
discussion related to hazard recognition and work planning, and general conversational features like intensity of
engagement by the primary speaker and the participants, the quality of questions in the conversation and a
demonstration of care by the primary speaker.

We are extremely pleased with the breakthroughs we have made in understanding and classifying multi
speaker analyses. Results of our study confirm that a combination of semantic and syntactic features indeed
help in assessing the health of a conversation. Using a combination of machine learning approaches the team
was able to reliably classify each theme with reasonably high-level accuracy. Confident that we can identify
these themes we built an integrated model that combines the multiple themes into a FactorLab Total
Conversation Score (TCS). We tested the integrated model accuracy against a training set of 1400 independently
scored conversations by safety experts to test the unified model’s ability to match scores with them.
The model classification of a conversation and the expert's classification of conversations match more than 74% of the time. This means we can with confidence classify multi-person conversations in harsh noisy environments considering cultural and high performing team factors of planning, caring, engagement and hazards.

Each conversation in the corpus was termed as a transcript that contains several turns each belonging to a particular speaker. **We were able to determine the primary and non-primary speakers in any transcript and derive features from each turn of the primary and non-primary speakers.** As humans we can effortlessly gauge care, planning, hazards and engagement in a sentence. So, we trained a multi-label LSTM classifier to classify sentences as one of the themes or a combination of classes. We were able to derive features from the transcripts and include embedding based features. **We developed a way to rank systems starting with bucketing classes, outlier removal, model fitting, determining observer engagement levels, evaluating question quality, and determining the planning effectiveness.** We analyzed the important but highly subjective area of caring. Because of its critical nature, we examined hazard related behaviors associated with less frequent but most lethal types of SIFs and number of fatalities. Working with the University researchers we detailed an integrated modelling approach scoring each conversation. Our model is capable of generating scores for all metrics simultaneously. It is also designed to maintain the existing correlations between the metrics. **The model was used to generate predictions that cluster transcripts and users to help determine overall health of a particular conversation.** We demonstrated how to extend clustering results to assess performance of an observer along seven conventional metrics. The reason for seven as opposed to four themes (caring, planning, engaging, and hazards) was that we distinguished the engagement category as having three components. We looked at both the engagement level of a participant in a conversation and an observer of the same conversation. One challenge we have discussed is the reluctance of individuals to identify issues, near misses or unreported events because of concerns of how it may impact them personally. To capture this, we included a theme focused solely on the quality of questions asked. Our belief is that those reluctant to report incidents tend to not engage in questions during our sessions. We distinguished information of two types of hazards. The first we call “real hazards” tend to be more frequent ones like not wearing PPE or observing an easy to detect hazard. The second “high hazards” are the more consequential accidents that may result in a SIF. While potentially far more severe they occur less often. Finally, because we predict seven metrics simultaneously, it is difficult to ensure that the same distribution of data is maintained in the distinct categories of “train”, “dev” and “test” sets. We then created a unique metric identifier for all data set combinations.

Our team developed an essential overall integrated or unified architecture where we input over 40 features. To train it we performed a five-fold cross validation to generate random seeds and to create the training, dev and
test 5 times. We assessed model stability plotting accuracy, precision and recall of metrics. The following cluster analysis groups individual conversations according to the seven themes and attaches scores for each transcript on all themes. Scores are averaged as one examines how highly rated a particular cluster is, which themes are strongest and where ones are deficient.

**What does cluster analysis this tell us and how can we apply it**

The cluster graphic reveals much. It shows highest overall average scores are for real hazards, or the less “high risk” hazards like wearing PPE, and in planning. It is not surprising because most workers are used to participating in PTP, it is just that up to 75% of PTP are viewed by experts as ineffective. Themes with low scores are in Question Quality perhaps because many workers are uncomfortable with asking questions or questioning safety practices. It is why so little interactions occur in these meetings. This is why participant engagement must be emphasized, reinforced and rewarded. It is widely recognized how essential active caring is to establish a mindset and commitment to working in collaboration with other team members and supervisors. We say active caring to distinguish activation of caring to achieve better outcomes from verbalized caring that makes for higher ratings on surveys but has no bearing on what transpires at a jobsite. Through modeling we have been able to capture this vital distinction.

If one approaches this from the perspective of the user not the modeler, the user wants to make sense of these complex diagrams and clusters. FactorLab makes it possible to request the machine read whatever answers, text, observations, audits, inspections, transcriptions, comments, etc. that exist and summarize them for you.
For example, if you simply type in how many times has someone mentioned "thank you or please, or good job" to gauge their level of active caring this month compared it to last month, the model can instantly create pie charts showing the results. You can do this for planning words and combinations of caring, engagement or any other areas you want to examine more closely. One does not need to examine only the entire PTP conversation, one can tailor the word selection to fit the desired needs. We enable the collection and analysis of many types of conversations captured and analyzed in many different ways. Our customers get excited with the ability to probe, explore, learn, and adapt their thinking.

![Pie Charts]

**Observations, Challenges and Transformative Opportunities in Worker Safety**

As we complete this paper we want to highlight what we have done, how we went about it, and what we have concluded. We believe we have brought together the best thinking, exploration and activation of ways to advance research on improving workplace safety to build on all the research work that has been done on safety practices system health. But we recognize that if our focus would be only at the construction site and not reach the CEO and management committee, their ability to make fundamental change would be limited and not inform and impact company culture, values or engage its employees. Our examination of thought leaders entered on operationalizing culture. This focused on reflecting the need for interdependence of CEO leadership and field-based performance related to safety as captured though videos of people in honest conversations.
This bi-directional bridge allows supervisors and all levels of management up to the CEO for the first time to experience and witness what occurs in the field. It significantly improves safety, or if ignored or dismissed only puts people at greater risk. The primary reason video conversations have not been considered by leadership was the belief they were not accessible. Now there are no excuses to not have truth speak to power in ways that demand power listens to truth. FactorLab was tempted to declare victory showing how every jobsite conversation between supervisors and their crew has meaning and adds value. But the question remained, how does one capitalize on this in a scalable manner consistent with time available and resources deployable. Being a hands-on technology company and student and long-time advocate for safety, we knew this would only be achievable through advanced applications of AI and ML. But to make a giant leap in understanding simultaneous multi-person interactions during PTPs we partnered with University of New York at Buffalo.

We believe this approach of tying together activities of researchers and doers has not been done before and why we believe we are on the cusp of a huge step forward in advancing safety in the real-world environment. We are realists and see that for these opportunities to be achieved one must overcome prevailing ways of looking at safety and to change mindsets at all levels. One of the largest areas is fear of blame for not identifying hazards or near misses. False assumptions that safety vs, productivity is a trade-off and choice, when they are mutually reinforcing, has been a barrier. There is also a fatalistic view that serious injuries and fatalities are part of the job and arguing culture change is too hard and takes too long. We need a jolt to address this and shift mindsets to embolden CEO leadership. Michael Beer summarized this succinctly:

“When company leaders can’t hear voices of their workers, serious strategic mistakes are likely. For this reason, leaders often get stuck in echo chambers that merely reinforce their own ideas”.

A few weeks ago, I realized that the question wasn’t, what is the path forward but, why have we not embraced as an industry the inspiration and blueprint offered 30 years ago. Sadly, Paul O’Neil, the former CEO of Alcoa recently passed away. His legacy as a leader and visionary when it comes to worker safety still is the definitive philosophy and belief system that treats safety as an essential integral part of company success. His singular passion for the safety of Alcoa’s employees communicated every day that Alcoa cares for its people and places their safety at the center of its culture and values. O’Neil saw safety as a “keystone habit”, which is something people become obsessed with and drives them to excel. An organization putting safety first gets it people to view it as a habit of excellence. Safety is also a natural rallying point showing connection throughout the organization among leadership, culture and employee engagement. On a personal note Paul O’Neill inspired me to dedicate most of my career to improving safety in the workplace. It evolved from working in the construction industry and at the jobsite to becoming a serial entrepreneur of technology startups with the most recent being
FactorLab. I learned from him that a successful company can keep people safe driving higher levels of performance, while operationalizing its culture and health.