Don't Buy Safety Software, Buy Answers!

Hazards are ever-present in the steel plant environment, and a heightened awareness and emphasis on safety is a necessary priority for our industry. This monthly column, coordinated by members of the AIST Safety & Health Technology Committee, focuses on procedures and practices to promote a safe working environment for everyone.

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Comments are welcome. If you have questions about this topic or other safety issues, please contact safetyfirst@aist.org. Please include your full name, company name, mailing address and email in all correspondence.

You may think I am crazy for saying this, since I run a safety software and services company, but I don't think you should buy any more safety software. What you need to buy are answers to your most challenging safety questions.

Automation and Efficiency Are Not Enough

Most safety software systems offer automation and digitization of the safety process. Safety software allows for efficiencies around data collection (for instance, by using mobile apps to collect safety inspections and observations in the field), but also around the reporting of that data through charts and graphs. These efficiency gains within the safety process allow safety functions to do more with less. The return on investment in these systems can be beneficial.

However, executives and other business leaders don't just want reports; they want answers. They don't want lagging indicator reports that can show only what has happened in the past; they want to know what's going to happen in the future. Think about it from a sales perspective: is the CEO more interested in how many new deals were sold in the last 90 days, or how many *will be sold* over the next 90 days? It is no different for safety. Leaders want forecasts and predictions as to what future safety outcomes will be, and then direction as to what actions they can take to positively affect those outcomes. Can your safety software system do this?

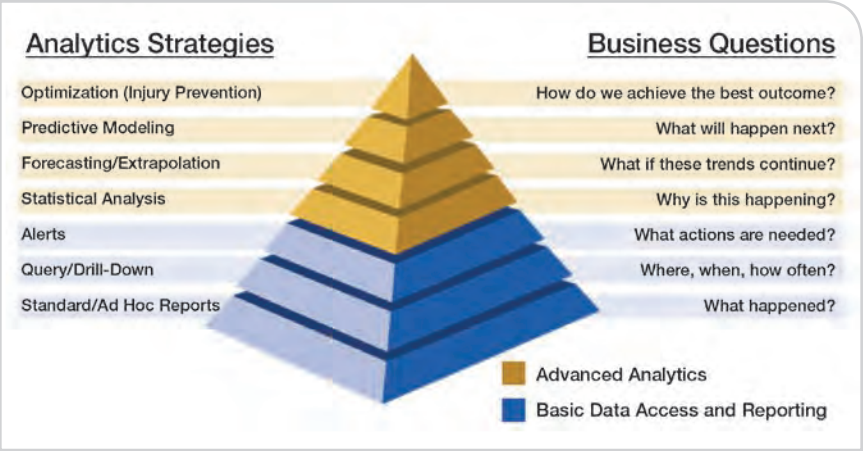
The Analytics Pyramid

To explore this further, let's look to the teachings of Tom Davenport and Jeanne Harris from their book, *Competing on Analytics*. In this book, Davenport and Harris discuss how, once data is collected, a user can do two things with it: basic data access and reporting, and advanced analytics. The former is what most safety software systems provide. These software systems, focused on digitization and efficiency, allow companies to collect data very easily and then create reports from that data. But what kind of business questions does this answer? Davenport and Harris' work suggests that only questions like "what happened" and "where, when, and how often" are answered. This doesn't tell us much about the future or answer the tough questions leaders are asking.

Leaders want the answers to more difficult questions like "why is this happening?" and "what if these trends continue?" Ultimately, leaders want the answer to "what will happen next?" In order to answer these questions, Davenport and Harris suggest companies need to move beyond basic data access and reporting and employ advanced and predictive analytics methodologies against their data sets.

Davenport and Harris suggest that once a leader can answer the penultimate question of "what will happen next," he/she can then optimize the response to this prediction in order to achieve the best result possible. In the case of occupational safety, this takes the form of injury prevention activities.

Figure 1



Adaptation of Davenport and Harris' model.

Figure 1 is an adaptation of Davenport and Harris' model for getting beyond basic data access and into advanced and predictive analytics. If your safety software system can allow only for standard or ad-hoc reporting and then queries or drill-downs into your data set, you will be limited to answering only the most basic business questions using lagging data (the blue area in Figure 1). But if your software system can deliver advanced and even predictive analytics, you can move up the analytics pyramid and provide your business leaders with the answer to one of their most strategic questions: "What will happen next?" Then you can drill back down into your collected data and determine how to achieve the best outcome, which in the case of safety is preventing predicted injuries from occurring. Your safety software system needs to get you to the top of the pyramid (the gold area in Figure 1).

Why Most Companies Struggle

Most companies struggle to climb the analytics pyramid for two main reasons: first, they have data limitations, and second, they don't have the proper analytics tools to derive answers from their data.

Data is the fuel for any analytics tool. If a company does not have enough data, if the data is not structured properly, or if the company doesn't trust the quality or accuracy of the data, it will not sufficiently power the company's analytics efforts.

Most companies, even some of the biggest companies in the world, don't collect enough data in a uniform way to drive robust analytics tools that can predict future outcomes and move companies up the pyramid. It often takes millions, and sometimes billions, of data points to achieve results with high confidence intervals. Also, most companies spend more time blindly collecting data than they do planning ahead as to how that collection should be structured or linked to safety outcomes. As a result, the data often cannot be used in a way that supports proper analysis. Finally, many companies simply don't trust the data that is being collected because some employees may not be committed to the data collection process.

The good news is that we are currently in the era of Big Data. More and more data is being collected every day, even within safety. This is an area where traditional safety software systems have been helpful — they make collecting data very efficient. However, because these software systems don't operate at the top of the pyramid, they overlook the need for structured, high-quality data that is linked to safety outcomes.

The second area where companies struggle is access to analytics tools that can move them up the analytics pyramid. Even if a company has a large, well-structured, high-quality data set, it often struggles to get answers when it doesn't have access to advanced and predictive analytics tools. Microsoft Excel is a fine tool for basic data access and reporting on lagging indicators at the bottom of the analytics pyramid, but it can't make predictions about the future. Many safety software systems have similar limitations.

In order to drive predictions about future outcomes across large sets of data, companies need robust advanced and predictive analytics, often in the form of machine learning analytics. Machine learning is the field of computing in which computers can learn without being explicitly programmed by humans. They learn by processing millions, if not billions, of data points and learning from the trends and correlations in the data. Once they have spent sufficient time learning, the computers can analyze new data sets that are similar and predict future outcomes. In the case of safety, this takes the form of predicting future workplace injuries.

In a paper titled "Predictive Analytics in Workplace Safety: Four Safety Truths That Reduce Workplace Injuries," a research team from Carnegie Mellon University showed how future workplace injuries can be predicted. This group gave four years of actual workplace safety data from several companies to a machine learning computer that was able to learn from the correlations in the data. After this learning process, the machine built a model that predicted injuries with accuracy rates as high as 80–97%.

How to Proceed

So if they shouldn't run out and buy more safety software, what should companies do?

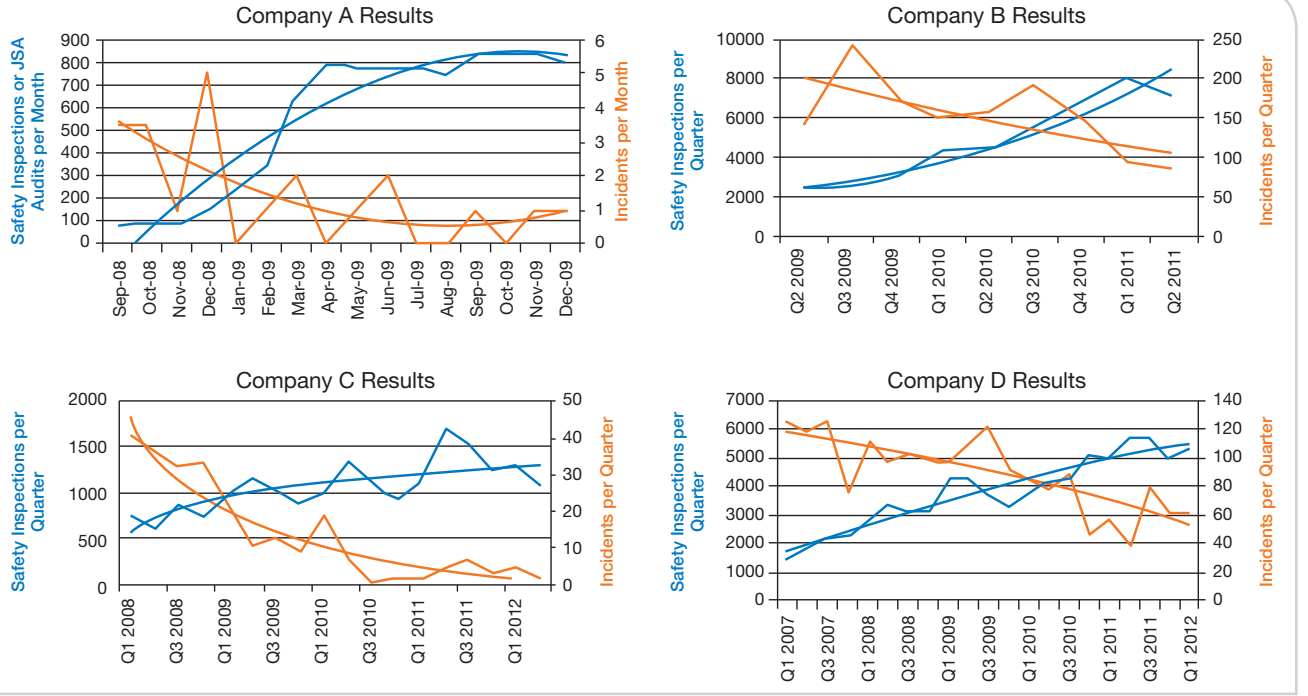
What I always tell companies is to consider the safety questions they are trying to answer. Once this is determined, companies can then determine what type of data needs to be collected to answer those questions. A good deal of time needs to be spent up front, planning what data will be collected, who will collect it, and how it will be structured and ultimately linked to safety outcomes. Generally, this step can be done with software and knowledgeable safety personnel. Only then will companies find any success in analyzing this data to answer business questions.

Then, once the analysis begins, companies need to determine if their analytics tools are robust enough to get them to the top of the pyramid. If not, it might be time to investigate a new safety software system. However, this can't be just a traditional safety software system that is focused on automation and efficiency. It must be a system that utilizes cutting-edge analytics tools — quite possibly including machine learning analytics.

Forward-thinking companies have proven that if they can collect the right data set, and then analyze that data set with the right tools, they can predict and prevent workplace injuries. Figure 2 gives just four examples of companies that have done this. Over time (the horizontal axis), these companies have collected more and more safety data (the blue line moving up from left to right), which fuels the advanced analytics in their safety software system, allowing them to predict and prevent workplace injuries (the orange line moving down from left to right).

The return on investment that traditional safety software systems can deliver from automation and efficiency is worth pursuing. However, the ultimate goal of any safety function within a business is zero injuries. If a traditional safety software system can't do this, should you buy it? Leaders don't want reports; they want answers. To give them answers, we need to go beyond traditional approaches and deliver a view into the future. Business leaders are used to getting this type of leading indicator information from sales, marketing and finance, and we can now give it to them in safety as well. If you are on a journey to get your injury rate to zero, think twice about the type of software required to get there. ✦

Figure 2



Analysis of safety data from four companies.