Form.com

A WorldAPP Product

Striking Operational Paydirt

Improving gold mining safety and productivity with mobile technology

Mining has long been considered one the world's most dangerous professions. For centuries, the hunt for valuable materials and minerals has led to tens of thousands of deaths and even more on-the-job injuries and long-term illnesses. And while most of the media attention has been paid to coal-related mining disasters over the years, goldminers have their own unique safety concerns that must also be addressed.

While just **1%** of the world's labor force works in the mining industry, **5% of all on-the-job fatalities are miners.**

The good news is, today's gold mining operations are dramatically safer than they've ever been, especially in the US. In fact, conditions have improved considerably since the 1900s when hundreds of Americans were dying each year in surface and sub-surface mines.

The bad news is, conditions aren't improving at the same rate globally. For example, while just 1% of the world's labor force works in the mining industry, 5% of all on-the-job fatalities are miners . To top that off, most of these fatalities are the result of potentially preventable incidents like equipment failures, rock falls, fires, and tunnel collapses.

What you'll learn

In this white paper, we'll discuss some of the most common safety challenges facing today's mining organizations, and the companies responsible for servicing mining equipment. We'll examine how paper-based forms, checklists, and an overall lack of technology is holding them back, denying them access to the valuable data they need to truly make a difference.

Finally, we'll explore how today's forward-thinking mining and service companies are using mobile technology and data to improve. They're monitoring dashboards to discover trends and areas where they can make process tweaks and adjustments, while building predictive models to help them proactively act on data gathered from audits and inspections. These data-driven measures are leading to more informed business decisions that not are not only improving safety, but also increasing efficiencies and productivity while decreasing capital and maintenance costs. They're doing this by:

- Fine-tuning processes to drive continuous improvement
- Implementing automated corrective and preventative actions
- Improving asset maintenance and utilization
- Relaying and displaying information more efficiently
- Proving regulatory safety compliance with digital forms

As Safety Plateaus, Profits Fall

Throughout the last century, the efforts of mining safety professionals, combined with decades of technological innovations, intense research, and preventive initiatives, have driven a worldwide reduction in the number and severity of mining accidents. That said, today's miners still operate in some of the most hazardous working conditions imaginable. In fact, prolonged exposure to gold mining activities can expose workers to a number of occupational safety and health hazards that can lead fatalities, injuries, and many other life-long problems.

While safety improvements have grown substantially over the past 100 years, developments have stalled over the past decade. In fact, conditions are worsening in many parts of the world. Sure, American goldminers are no longer dying at a 300-per-year rate like they were in the

In South Africa where fatalities are up

20%

conditions are quickly deteriorating

early twentieth century, but 122 of them still lost their lives over the last five years. And in deep mining countries like South Africa (where fatalities are up 20% [II]) conditions are quickly deteriorating.

These mounting injuries and illnesses are also having a negative impact on yield. Last year in the United States alone, more than 1,000 metal and nonmetal mining operators suffered nonfatal on-the-job injuries — resulting in 44,028 days of lost work time and a huge drop-off in productivity. [III]

As a result, worldwide mining operations are now 28% less productive than they were just ten years ago. Combine this with falling commodity prices, cost inflation, and lower ore grades, and many of today's mining corporations are finding themselves under tremendous financial pressure. This is leading many of them to take greater risks, dig deeper pits, and cut far too many safety corners.

Employees, meanwhile, aren't at all happy about it. In fact, this risk-taking has led to a global goldmining talent shortage, particularly when it comes to occupational hygiene and ventilation engineers who've spent the last decade leaving the gold mining industry in droves for industries with safer working conditions.

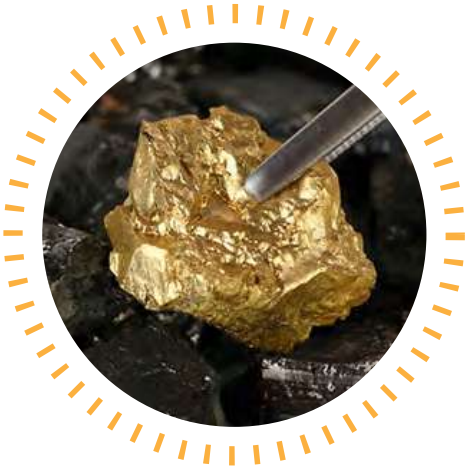
Worldwide gold mining operations are now

28%

less productive than they were just ten years ago. [VI]

Frustrations are mounting

For most mining safety professionals, the same drive and incentive that gets them going in the morning also keeps them up at night. While most of them they love what they do (reducing accidents, saving lives, and continually improving workplace health and safety), many are becoming more and more frustrated with their inability to implement strategic safety measures that really move the needle.



First, while most paper-based mining operations have done what they can with the information they have, most have maxed-out the number of data-driven adjustments and tweaks they can make. Keep in mind, these adjustments and tweaks probably took a very long time to enact, as data from paper-based audits and/or inspections can sometimes take up to 9 months to process. It's no wonder safety

professionals are frustrated. How can they be expected to make any meaningful changes if it takes them almost a year to get their hands on any real data?

Second, fines and sanctions may soon become extremely costly for operations lacking electronic documentation of their inspection and audit results. Newer, more stringent government regulations are emerging and evolving in countries all over the world, and they're all requiring that safety documentation and proof of compliance is always current and available – which won't be an easy task for companies whose filing cabinets are already busting at the seams.

Consider the reporting requirements outlined in the MSHA's Final Rule on Workplace Examinations, scheduled to take effect in the US on July 24, 2017. Safety professionals and GMs who continue to rely on paper and spreadsheets will soon be in for a rude awakening if they don't start preparing for a digital future. There's just too much paper manage, too many spreadsheets to handle.

Paper and spreadsheets aren't a problem for miners — they're an operational nightmare. Paper-based forms, checklists, and documents are easily lost or destroyed. Plus, manual data entry opens the door for human error, which can easily lead to a disaster. And as far as spreadsheets are concerned, without countless hours of tweaking and analyzing, spreadsheets aren't any better than paper.

Mobile devices and apps, on the other hand, are like the holy grail of tools for mining safety leaders. Companies are gaining more efficiencies and greater productivity simply by arming safety professionals with mobile data collection platform and enabling them to improve using the power of technology and data.

Not only are these mobile devices easy to carry and use in any location or situation, they can also rescue data from the depths of a filing cabinet (or database, or spreadsheet, or shirt pocket) and put it to work on a path towards driving continuous improvement.

More challenges on the horizon

MSHA's Final Rule on Workplace Examinations in Metal/Nonmetal Mining Operations

1. *Workplace examinations must be conducted every day before miners begin working*
2. *Operators must immediately notify miners of all adverse safety or health conditions*
3. *Operators must show proof of corrective actions, taking note of the date and time*
4. *All records must be available for inspection by MSHA, Secretary of Labor, and miner representatives.*

Mobile Technology may be the answer

The recent reduction in gold extraction (and subsequent drop in bottom-line profits) is pressuring mining operations all over the world to control all costs and use capital wisely. Consequently, many are hesitating to invest in mobile technology, opting instead to spend on core excavating needs like trucks, tools, in-pit crushers and conveyers. In fact,

today's natural resource companies spend just 1% of revenue on technology, compared with 5–7% for most industries.[VII]

While it's true that a few new jackhammers might lead to a temporary spike increase in production, companies that implement mobile devices, software, and apps are investing in the long term, preparing for the digital future of mining. They're also reaping immediate short term gains in the meantime with improved and automated inspection and audit processes.

Mining organizations with mobile technology are also reacting in real-time to any and all identified problems. They're automating CAPAs and implementing predictive maintenance programs to increase machine uptime from pit to plant. They're finding and fixing problems before they happen, leading to fewer accidents, greater productivity, and less downtime. Some are even leveraging data to help them find mineral deposits and optimal drill locations without the costly expense of hiring a third-party geologist.

MINING OPERATIONS ALSO USE MOBILE TECHNOLOGY TO PERFORM:

Safety Checks: Managing safety risks and violations with standardized incident reporting and insight into day-to-day operations.

Site Audits: Performing ongoing site quality, HSE inspections, and observational-based audits to improve safety and ensure compliance

Asset Inspections and Management: Managing and analyzing asset performance with risk-based inspections and predictive maintenance.

Process Audits: Quickly measuring observed behaviors against predetermined mining safety, procedural, and operational standards

Automated CAPA and Workflows: Gathering data from inspections and audits to trigger automated action plans and workflows to fix issues and streamline operations.

Data can drive improvements

According to a recent Mining Journal survey, the next big driver of goldmining safety, efficiency, and productivity will be the analysis of Big Data. Big Data is expected to allow for faster and more informed decisions at all levels of ore extraction, transportation, and processing. And it makes perfect sense. Today's mining companies are already collecting huge amounts of data from drills, trucks, processing plants, and trains. So why are they only using less than 1% of the information they're collecting?[VIII] For the most part, it's because they don't have the technology to gather and process that data.

With the right technology and a willingness to learn from data however, mining operations can quickly start generating thoughts and conversations where real learning can happen. Over time, this learning can spark better ideas, smarter decisions, and strategic initiatives that not only move the needle for safety professionals, but fundamentally change the direction of the company.

This fundamental change happens when good, meaningful data is used to generate strategic undertakings, like predictive models that identify and prevent safety hazards, bottlenecks, and waste patterns before they lead to any injuries, illnesses, or operational slow-down.

This same data is also being used to extend equipment life. By analyzing machine patterns and trends, companies can use data to predict when tools, equipment, and vehicles are most likely to fail, and proactively perform preventative maintenance before an accident or breakdown has a chance to occur.

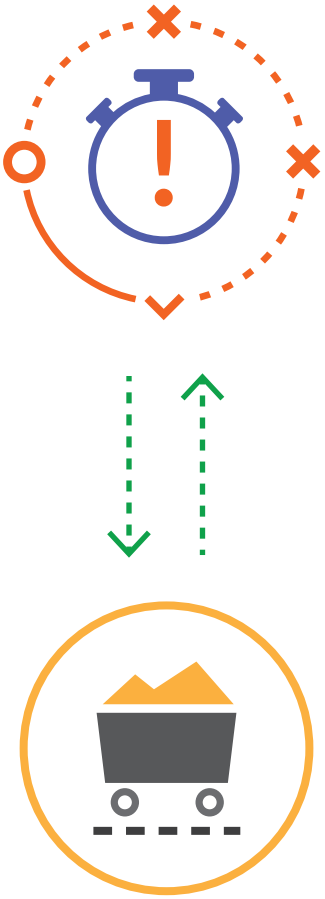
With the right technology and a willingness to learn from data, mining operations can start generating thoughts and conversations where real learning can happen.

8 bottom-line benefits of mobile technology and big data in mining

1 React in real-time

Collecting data is one thing; doing something meaningful with it is another. Mobile technology allows for the seamless transfer of data between remote mining operations and decision-makers in central offices. So instead of waiting up to nine months to review actionable data, colleagues can share and interpret data in real time.

Collecting data is one thing; doing something meaningful with it is another.



This real-time intelligence brings newfound agility to mining operations, enabling them to make faster, more informed decisions (from the office or the jobsite) in just hours or days instead of weeks or months. These strategic adjustments can drive efficiencies throughout the entire operation; everywhere from predicting safety hazards and asset maintenance needs to forecasting market demand, optimizing supply, and identifying optimal drill locations.

2 Drive operational efficiency

Mining companies that leverage technology to continually monitor and analyze the data collected from various processes and procedures quickly discover whether their operations are running as expected or not, whether employees are executing procedures as planned, and whether they're filling out the proper paperwork to document completed tasks.

With this data, GMs and safety leaders can make operational tweaks and adjustments to drive efficiencies and improvements. These adjustments can often lead to increased productivity, fewer unplanned shutdowns, and most importantly, fewer injuries, illnesses, and deaths.

With this data, GMs and safety leaders can make operational tweaks and adjustments to drive efficiencies and improvements.

3 Save Money

Investing in mobile technology can help mining operations save money in a variety of ways. First, data-driven preventative actions can lead to improved conditions and fewer injuries and illnesses, not to mention a reduction in site downtime (which can lead to millions of dollars a day in losses if not prevented).

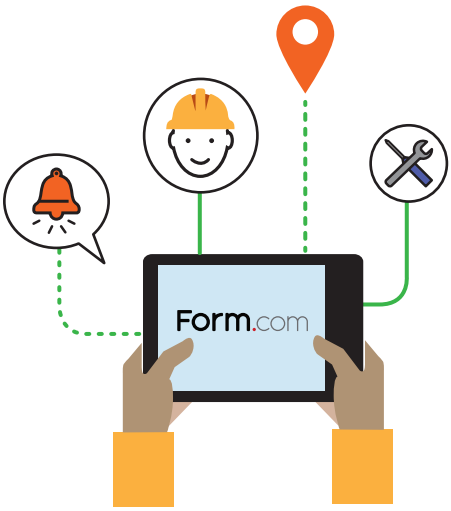
Second, access to the right data can help companies identify measures to extend equipment life and reduce maintenance costs. For example, fuel and tires are two of the largest costs facing today's mining operations. Data gathered from haul road inspections (slope hazards, surface conditions, stopping distances), combined with data captured from vehicle inspections (tire pressure, scheduled repairs, faults, driver information) can help companies identify patterns, trends, and preemptive measures they can take to maximize fuel efficiency and extend tire life.

Access to the right data can help companies identify measures to extend equipment life and reduce maintenance costs.

4 Establish and maintain accountability

Safety processes and procedures are in place for a reason. And while most operations would love to believe that their employees are always doing everything they should be doing, ongoing auditing takes any question out of the equation.

Regular audits performed with mobile technology not only ensure that all safety procedures are being followed, but they also generate embedded data that can prove compliance. Safety leaders and GMs can easily identify who did what, when, and how. And if anything goes wrong, companies have the proof they need to keep employees responsible for their actions.

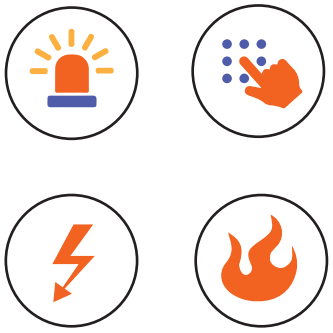


5 Reduce errors

Capturing data with mobile devices eliminates the need for office staff to manually enter data from a paper-based form or checklist, reducing the risk for human error that can lead to disastrous implications in the form of accidents, illnesses, and environmental disasters.

6 Improve Morale

In an industry as dangerous as goldmining, positive morale starts with safety. After all, nothing rattles a crew more than witnessing (or even worse, experiencing) a serious accident while on the job. Workers want to come into work each day trusting that their safety is a top priority. But to truly gain their trust, mining companies must first prove that the health and safety of their employees are their top priority.



To do this, mining operations are investing additional time and resources in training programs that increase awareness and vigilance. They're establishing operations that prove they won't tolerate anything less than safe work processes. But perhaps most importantly, they're investing in technology and using the data they gather to make life-saving changes, proving to their workers that safety is their top concern.

7 Drive Continuous Improvement

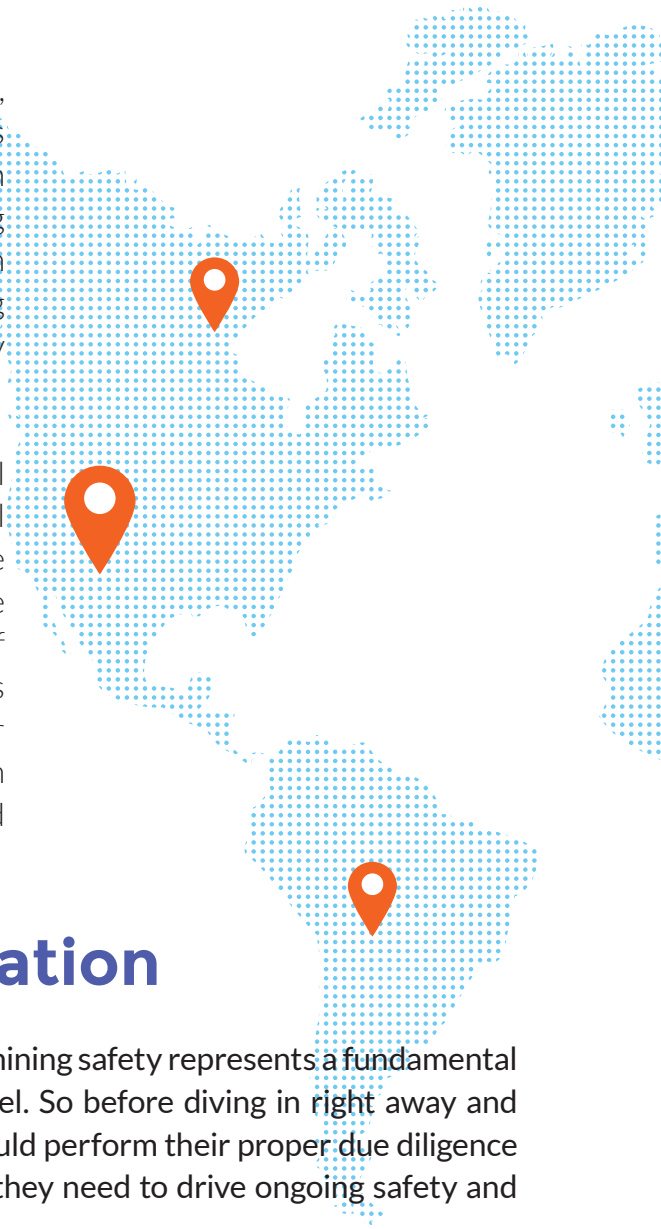
In mining, the idea of continuous improvement refers to the ongoing process of improving mining production, safety, and efficiency over time with incremental improvements based on data gathered from inspection and auditing programs.

When consistently analyzed and refined, data from continuous improvement initiatives can have a huge impact on mining productivity and efficiency, helping companies understand what's most important to their day-to-day operations, how they can focus their attention to improving in those areas, and how those improvements can ultimately drive the bottom line.

8 Stay Compliant (and prove it)

Mining is one of the most highly-regulated industries in the world, with complicated guidelines, restrictions, and standards that vary from country to country. Managing accurate data is critical to confirming compliance with these standards, whether operations are in the US, Canada, or spread across the globe in countries like South Africa, Australia, Chili, Argentina, and Peru.

Maintaining compliance for large-scale global operations, especially those operating in many of the countries mentioned above, can be a challenging task as well. But with mobile technology (especially software with geo-tagging and photo capture/markup capabilities) companies can ensure that all data is captured correctly and being provided to regulators with the speed, depth, and accuracy needed to prove guidelines are being met.



Finally, with the MSHA set to start enforcing their Final Rule on Workplace Examinations in Metal/Nonmetal mining operations in the United States, companies are scrambling to find the right technology to facilitate compliance. Because come July 24, 2017, a new group of inspection, notification, and corrective action requirements is set take effect, and companies still operating with paper or spreadsheet-based data collection methods will soon find themselves overwhelmed with documentation and unable to meet the new regulations.

Recommendation

The idea of implementing mobile technology to improve mining safety represents a fundamental shift in a company's vision, strategy, and operating model. So before diving in right away and buying a new solution, GMs and safety professionals should perform their proper due diligence to ensure they're getting the features and functionality they need to drive ongoing safety and compliance at their operation.

Here are a few things to consider:

Get the right software (and the right partner)

Safety professionals can do a lot of great things with the right mobile software or app. From a high level, they can completely centralize, manage, and automate auditing and inspection processes while storing data from across the operation in one place for easy access and search. The can also automate workflows and set automatic triggers to kickoff time sensitive CAPAs (more on that later).

At a more tactical level, miners with mobile technology can take photos of violations or problems with their device's built-in camera while performing inspections. They can then mark up photos with notes and captions by simply by drawing on them with their finger.

It's important that mining operations heavily vet software vendors, however, to ensure they're partnering with the right company. They should also avoid cookie-cutter out of the box solutions. With so much change in the mining industry, it's never good to go with an inflexible point solution. Instead, mining companies should seek out partners that can easily integrate the solution with their existing systems, while allowing for full customization of the entire experience, complete with unique forms, checklists, workflows, and features that meet their operational needs.

3 KEY FEATURES TO LOOK FOR WHEN EVALUATING MINING SAFETY SOFTWARE

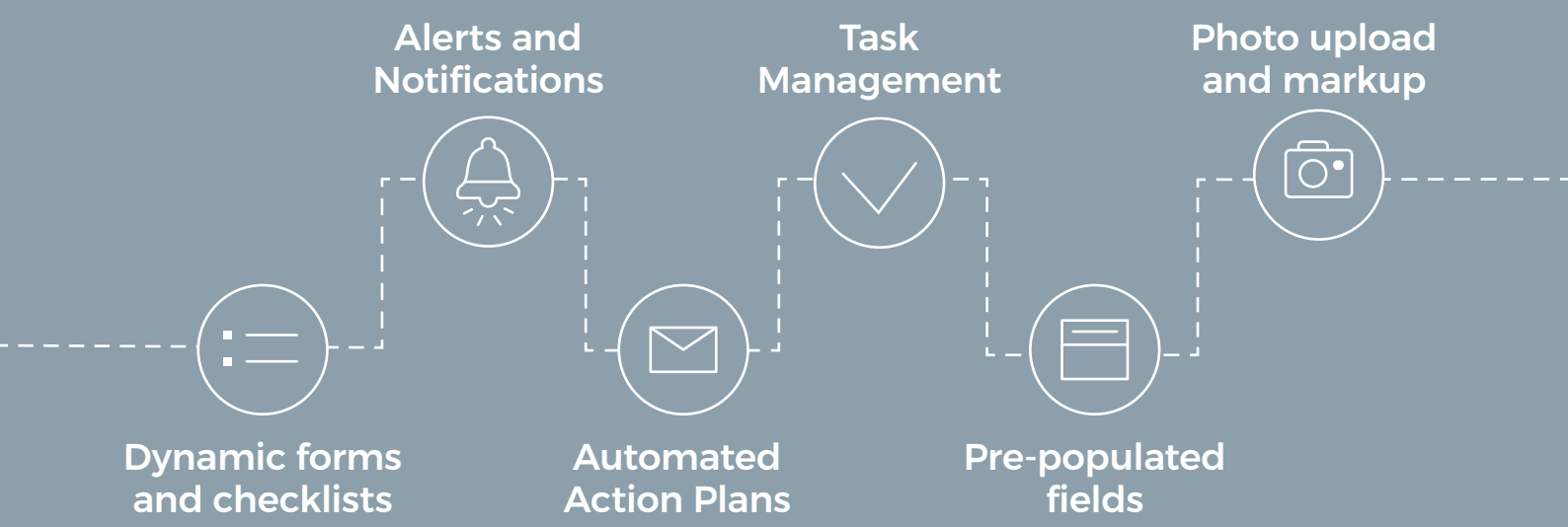
1

Offline functionality

Most, if not all, mining operations are situated in areas so remote and removed from civilization that they can't get an internet signal at the surface of the mine, let alone hundreds of feet underground. That's why offline functionality is such a critical feature to consider when shopping for mobile software.

With offline functionality, operators can still use their device to complete important forms for inspections and audits, capturing all the photos and evidence they need. And as soon as they're connected again, all the data will be sent to the right places while follow-up tasks and alerts are sent to their destination.

Additional features to look for



2

Time and date tagging

As we mentioned earlier, many new regulations are being enacted across the gold mining industry to ensure that regular safety audits and inspections are happening, and that proper safety measures are being followed. Keep in mind that most of these new regulations require daily proof of compliance, complete with times and dates of any adverse conditions and subsequent corrective actions taken.

Mobile software automatically captures and embeds this data into all records, making all completed forms automatically available for review by government/industry regulators and authorized personnel.

3

Automated corrective and preventative actions

The key to CAPA is speed and accuracy. Time is of the essence in mining safety, so safety professionals need to get things fixed as soon as possible… and prevent problems from happening again. After all, if a piece of equipment is malfunctioning or if employees aren't following proper safety procedures, what's more important than getting that corrected right away and making sure it doesn't happen again?

The right software can arm mining operations with the information they to educate employees, and prevent future mistakes. For example, when an issue arises and needs to be corrected, safety leaders can leverage their mobile software to create a learning experience for workers, visually explaining why something went wrong instead of just pointing out mistakes. They can even pull up and share relevant compliance recommendations directly from their mobile device to make sure the problem doesn't happen again.

Automation makes the CAPA process even more effective. Automated CAPAs can trigger activities based on any entry, response, or incident. Based on the information submitted in a form, the software automatically kicks off action plans, notifications, maintenance requests, or requests for audits or re-inspections. At the same time, when violations are found, submitted forms can automatically route reports or alerts to the right people in and outside of the company for follow-up or review.

A few final thoughts

As we've discussed many times in this paper (and as you already know full well), mining for gold is an incredibly dangerous business. And while conditions have improved in a few select countries (like the United States and Canada), global safety improvements have recently stalled in many others, resulting in an increase in injuries, fatalities, illnesses, and environmental disasters.

The primary goal of any mining safety professional has always been to make sure that every miner in the operation makes it home safely to their family at the end of each shift. But in this time of falling global production and rising costs, they're also being asked to find strategic ways to streamline operations and improve margins. Tasked now with improving both safety and productivity, today's goldmining examiners, inspectors, and auditors who are now drowning in paper and overwhelmed with regulations are turning to mobile technology for help.

Mining operations that perform inspections and audits using mobile technology are starting to notice a fundamental shift. Not only are they driving improvements in labor conditions, they're also finding ways to reduce their environmental impact while driving operational continuous improvement -- leading to fewer fatalities and injuries, lowered waste and emissions, and increased transparency and productivity.

While there's no real way to predict where the mining industry will go in the next ten years, it's widely believed that the measure of a successful mining company will someday shift from how well a company excavate golds to how well it collects, analyzes, and acts on data to excavate gold in a safer, more productive and efficient manner. In the end, forward-thinking companies that have made the investment in the tools they need to start gathering that data are likely to prosper. Those content with paper, spreadsheets and operational status quo, meanwhile, will soon be left in the dark.

I. https://www.cdc.gov/features/foodborne-diseases-data/

II. http://nodirtygold.earthworksaction.org/impacts/worker_rights_and_safety#.WO_xjmnyvIU

III. https://www.bloomberg.com/news/articles/2016-09-08/deeper-gets-deadly-for-workers-in-aging-south-africa-gold-mines

IV. https://www.cdc.gov/niosh/mining/works/statistics/factsheets/miningfacts2015.html

V. http://www.mckinsey.com/industries/metals-and-mining/our-insights/productivity-in-mining-operations-reversing-the-downward-trend

VI. http://www.miningweekly.com/article/gold-mining-industrys-effects-on-health-of-mineworkers-2013-08-02

VII. http://www.mckinsey.com/industries/metals-and-mining/our-insights/productivity-in-mining-operations-reversing-the-downward-trend

VIII. http://www.digitalistmag.com/industries/mining/2015/02/18/top-10-use-cases-big-data-mining-02248606

IX. http://www.mckinsey.com/industries/metals-and-mining/our-insights/how-digital-innovation-can-improve-mining-productivity

Got questions? We can help!

Form.com is a flexible platform designed to take time-consuming procedures done on paper and spreadsheets and turn them into user-friendly forms. Our mobile and offline app allows you to access and complete forms from anywhere, even while offline, and our team of experts will work with you every step of the way to create your ideal solution.

For more information

Call **1-888-708-8118**

or email **info@worldapp.com**