WORKtoZERO
an nsc program

Making the Business Case for Safety Innovation

National Safety Council

Calculating the Business Case for Safety Innovation

Fatalities in the workplace continue to present employers with unsurmountable challenges. The number of fatal occupational injuries in the U.S. totaled over 5,300 in 2019, with a fatality work injury rate of 3.5 fatalities per 100,000 full-time equivalent workers. This represents a steady increase over the prior three-year period (BLS, 2019).

In 2019, the Work to Zero initiative at the National Safety Council began working on a mission to eliminate non-roadway workplace fatalities by 2050. The initiative focuses on educating employers on the vast benefits associated with technological safety enhancements in the workplace, most notably, the reduction of serious injury and fatality (SIF) events. As part of this initiative, NSC is developing a number of return on investment (ROI) calculators as a tool to support environment, health and safety (EHS) professionals in building the business case for safety innovation.

This report examines eight key technologies that can be utilized to reduce injuries and fatalities in the workplace. Additionally, it outlines the steps an EHS manager can follow to make a business case and highlight how to leverage the output from a ROI calculator to successfully gain stakeholder buy-in for technological investment.

Work to Zero Highlights Eight Technologies to Support the Reduction of Fatalities

EHS technologies play a significant role in helping mitigate both situational (e.g., falls, struck-by) and systemic risks (e.g., lack of training, fatigue) contributing to SIF events. This report will discuss the benefits of innovation and highlight technologies across different stages of maturity geared towards eradicating workplace fatalities.

Work to Zero identified eight technologies showing potential for reducing risk related to a number of hazardous situations (e.g., confined space entry, construction/installation, heavy machinery operation) found to be contributing to non-roadway workplace fatalities. These hazardous situations were outlined in the Work to Zero's initial research report, *Safety Technology 2020: Mapping Technology Solutions for Reducing Serious Injuries and Fatalities in the Workplace.* While the technologies featured in this report can be implemented across a variety of industries and use cases, greater impact is found across safety-sensitive industries, including but not limited to: construction, manufacturing and mining **(See Figure 1).**

The technologies cited in this report reduce workplace hazards through risk mitigation or risk elimination using a range of diverse approaches. From in-cab solutions for fatigue monitoring alerting an equipment operator once fatigue or distraction is detected, to drones reducing human exposure to confined space entry tasks, EHS professionals should leverage the most applicable and innovative technologies to address hazardous situations leading to workplace fatalities.

TECHNOLOGY	DESCRIPTION	BENEFITS
Autonomous Mobile Robots (AMRs) for Material Handling	Autonomous mobile robots (AMRs) are sensor-enabled robots that can understand and move through an environment without being overseen directly by an operator or on a fixed predetermined path.	Decrease ergonomic risks and reduce material handling related injuries. Improve efficiency and productivity of material handling activities.
Fatigue Monitoring Wearables	Wearable vital sign monitors that monitor bodily metrics in real time to measure worker fatigue.	Improve fatigue management, reduce absenteeism, presenteeism and health care costs.
Lone Worker Mobile Applications	Mobile device applications that are used for workplace violence reduction, predominately for employees that work by themselves without close or direct supervision.	Improve lone worker monitoring, emergency response times, critical event management and communications.
In-Cab Solutions for Fatigue Monitoring	In-vehicle camera-based driver monitoring systems that detect fatigued and distracted driving and alert drivers and supervisors to real time risks.	Reduction in fatigue-related worksite vehicle incidents and associated reduction in property and vehicle damage costs.
Permit to Work Software	Digital workflow and content, which enable operations and safety managers to apply an approval process that manages risks relating to hazardous work activity and speeds up the process of signing off jobs.	Decrease risk on site through verification of credentials, improve risk management, hazard mitigation and operational visibillity.
Proximity Monitoring Wearables	Fixed or wearable sensors that detect the location of nearby objects without physical contact and alert to impending collisions and warn employees of hazardous situations.	Reduce transportation or contact-related incidents between employees and machinery/equipment. Decrease property/infrastructure damage and replacement costs.
Virtual Reality (VR) for Digital Training	Virtual reality (VR) devices that immerse the user in an environment that is entirely computer generated but allows the individual to navigate the environment as if physically there. VR safety training allows workers to gain experience in a realistic and immersive simulated environment.	Increase training retention, impact and engagement. Provision of safe training environments for high risk work.
Unmanned Aerial Vehicles (UAVs) for Confined Space	Unmanned aerial vehicles (UAVs), commonly known drones, are aircraft managed by a ground-based controller that can be leveraged for confined space inspections.	Risk eradiction or mitigation by decreasing the demand for worker-led confined space inspections. Increased efficiency and improved quality/accuracy of inspections.

Figure 1. Eight technologies supporting the reduction of non-roadway workplace fatalities

Steps Toward Building a Business Case

As businesses navigate towards technological adoption, multiple steps are required to complete before business-wide implementation can occur **(See Figure 2)**. First, the employer must determine their business goals – reviewing how technology can fit into the strategic plan and ongoing initiatives. Management looking to substantially reduce incidents in the workplace often seek technological enhancement as a route towards achieving this objective.

Once technological enhancement is determined as a possible solution for helping the employer achieve their business goals, a management of change process is considered. Senior leaders must determine whether technological adoption can occur seamlessly without adversely impacting operational activities, such as job hazard analysis and document control processes. Additionally, as infrastructure, processes and people represent the business' fundamental components for operational capacity – the digital readiness of these elements must be critically analyzed, ensuring operational components can actively adapt to technology implementation.

Computing the financial implications of technology adoption represents arguably the most essential step towards initializing investment – to make the case to management to prioritize project budgets. Here, a return on investment (ROI) calculator is a valuable tool to help support a business case for innovation by providing a metric for profitably of the investment; comparing investment cost to how much is earned/saved from implementation.

A final step in building a business case entails piloting the technology to analyze the real-time effect on operations and utilizing an implementation roadmap that provides support to relevant teams throughout the lifecycle of a technology application.

Figure 2. Steps involved in building a business case

ROI Calculators: A Quantifiable Foundation for Building the Business Case for Safety Innovation

Financial constraints are a common barrier to investing in safety technologies, particularly across low-margin industries. Employers are continuously seeking to understand the extent to which the investment will yield a positive net return and identify the expected break-even point. These are two questions which can be empirically estimated through the use of a ROI calculator – due to the models' focus on the relatively short-term returns and profitability.

ROI calculators for technological investment focusing on reducing critical workplace incidents are based on a comparison between the costs associated with a "business-as-usual" state and a scenario utilizing the adoption of technology. Assumptions on cost components, such as injury costs, are calculated to only incorporate incidents to which the technology is directly aimed at mitigating. Ensuring the comparison between business-as-usual and

technology adoption can occur, the calculators use validated assumptions regarding the expected 'percentage reduction in incident rate due to the investment of technology.' This percentage is calculated from case studies of corporations adopting the technology across various industries and at different scales for use.

A diverse list of assumptions are incorporated within the model mechanics to enable an actionable output of the ROI calculator. These assumptions range from a per employee industry average of workers' compensation from incidents in the workplace, to annual software costs associated with technology adoption. Model assumptions are defined through the utilization of data points from reputable data sources including, but not limited to, the Bureau of Labor Statistics (BLS), Occupational Safety and Health Administration, National Safety Council, as well as vendor and expert interviews.

ROI Case Study for a Construction Company Adopting Proximity Monitoring Wearables

Proximity wearables are utilized across a wide range of industries to minimize risks in the workplace. Predominantly, the technology is adopted in safety-sensitive industries, such as construction. Nevertheless, an ROI calculator can be used to evaluate the benefits of innovation across the full spectrum of industries and businesses. Small to medium-sized companies may find particular value in using an ROI calculator as they often deal with a more limited budget compared to larger companies.

The calculator inputs have a direct interaction with the models' assumptions, therefore have a large effect on the final output analytics. As an example, for the proximity monitoring wearables calculator, the 'do you have nightshifts?' input directly influences the incident frequency within the workplace – due to studies empirically proving a higher incident rate for 24-hour operations utilizing nightshifts. Therefore, inputting 'yes' will lead to higher injury and fatality costs in a business-as-usual scenario – also leading to a greater reduction in costs from the technological investment. Thus, a greater benefit for adoption will display in the calculator's output.

The ROI calculators are based on targeted inputs from the user interacting with a series of validated assumptions to produce a meaningful output and visualization of data **(See Figure 3)**. Using a large construction company interested in investing in proximity monitoring wearables as an example, the ROI calculator can demonstrate the costs and value of innovation.

Proximity Monitoring Wearables

Number of high risk worksite machinery/vehicles requiring proximity beacons attached	200
Number of employees requiring proximity monitoring wearables per shift	1,000
Industry risk category	High Risk
Do you have nightshifts? (Yes/No)	Yes

Figure 3. Large construction company inputs for proximity monitoring wearables ROI calculator

For proximity monitoring wearables investment, there is both an initial hardware cost and an annual software subscription fee for access to the data analytics platform. The hardware cost is divided into beacons for heavy machinery or equipment and the number of proximity wearables required for employees. Beacons are attached to the machinery or equipment to enable wearable devices to alert a worker who enters a proximity of danger, reducing the risk of collision or an employee being struck.

As the construction company operates in a high-risk industry category combined with employees working nightshifts – the model measures that the business would have a relatively high incident rate and associated costs in a business-as-usual state.

The calculator determines investment in proximity monitoring wearables for the large construction company to have a net positive return after the first year **(See Figure 4)**. This is enabled due to the relatively low hardware costs for the beacons and wearables, coupled with a large reduction in the incident rate as a result of the implementation of the safety technology. This positive cost trend continues over the five-year period, with a $1.78 million cumulative positive return predicted.

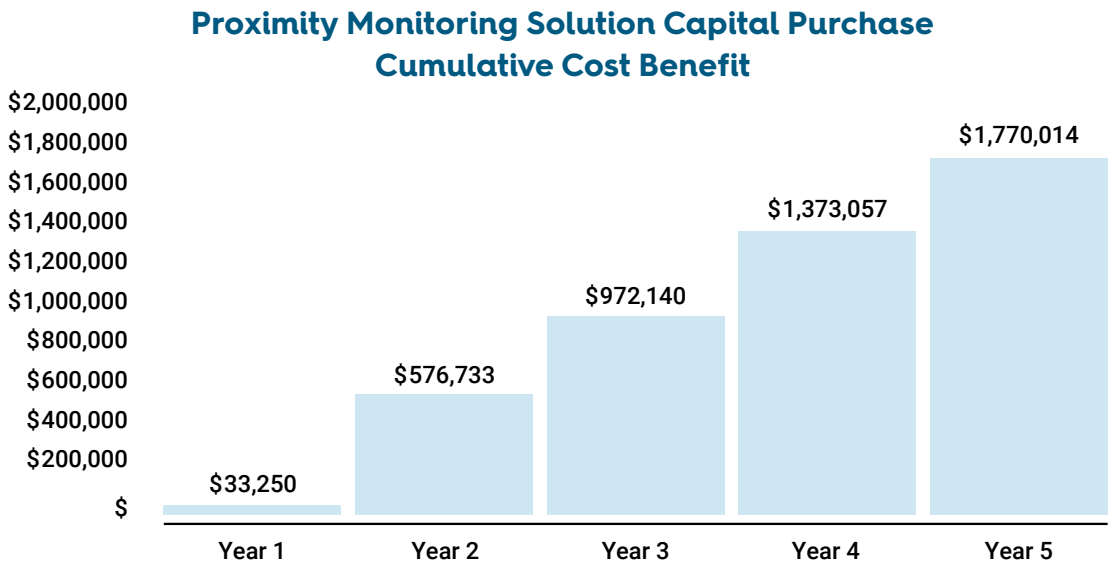

Figure 4. Cumulative cost benefits of proximity monitoring wearables adoption at a large construction company

ROI Case Study for a Retail Employer Adopting Proximity Monitoring Wearables

Utilizing the adaptability of the ROI calculator, an example of a small retail business seeking to adopt proximity monitoring wearables can be analyzed **(See Figure 5)**. As the retail industry records a relatively low rate of collision- or contact-related incidents per worker, the industry is classified 'low-risk.' Additionally, this example company has a lower incident rate due to the lack of nightshifts for employees coupled with a low employee to heavy machinery/ equipment ratio.

Proximity Monitoring Wearables	
Number of high risk worksite machinery/vehicles requiring proximity beacons attached	10
Number of employees requiring proximity monitoring wearables per shift	100
Industry risk category	Low Risk
Do you have nightshifts? (Yes/No)	No

Figure 5. Small retail company inputs for proximity monitoring wearables ROI calculator

The calculator output paints a vastly different picture when compared to the large construction company, with the fourth year representing the year of investment return **(See Figure 6)**. Irrespective of the difference, technological investment still shows a cumulative positive return of $4,118 after five years. The longer payback period is a direct result of the lower injury and fatality costs in the business-as-usual scenario. Therefore, technology adoption has a lower absolute reduction in costs – while hardware and software costs per device is the same across both example companies.

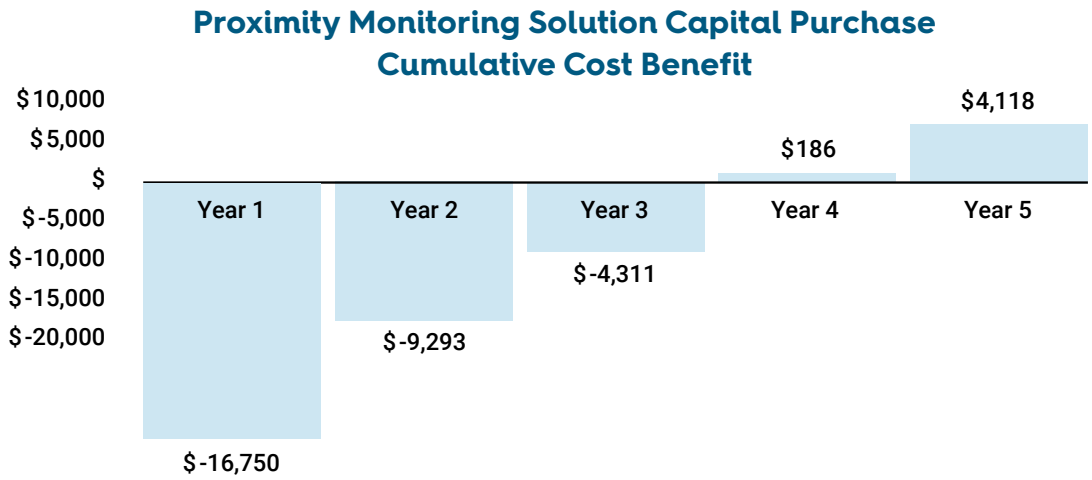

Figure 6. Cumulative cost benefits of proximity monitoring wearables adoption at a small retail company

Conclusion

As EHS professionals look toward building a business case for technology adoption, there are multiple steps to follow to create a complete value proposition and justify an investment. ROI calculators provide a vital component of the story, by quantifying not only the costs, but the broader safety benefits gained through the investment. These tools can also facilitate decision-making as businesses can model different scales of adoption to determine the most effective implementation approach to meet their needs and budgets.

It is important to note while ROI calculators increase transparency of the investment case, there remains a range of benefits which are harder to quantify —such as brand protection—that can be gained from the adoption of technology to save lives. An employer experiencing frequent injuries and fatalities in the workplace is likely to experience significant reputational damage due to media articles citing dangerous work conditions. As such, these models should not be used as a standalone mechanism, but as part of a broader strategy to assess the impact of technological enhancements for safety.

The pace of innovation is progressing rapidly and as technologies mature and adoption rates increase, the business case only strengthens. Using ROI calculators as a tool, EHS professionals can better communicate the value of incorporating high impact technologies into their operations to mitigate key risks and prevent fatalities.

Visit **nsc.org/wtzresources** to access our Work to Zero investment calculator.

NSC Employer Investment Calculator
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