



SKANSKA:

Reducing risk and improving safety with Smartvid.io, Autodesk's BIM 360 and machine learning

OVERVIEW / BACKGROUND

Skanska USA is one of the largest, most financially sound construction and development companies in the U.S., serving a broad range of clients including those in transportation, power, industrial, water/wastewater, healthcare, education, sports, data centers, government, aviation and commercial. In 2016, their work in building construction, civil and power/industrial construction, commercial development and infrastructure development (public-private partnerships) generated \$6.8 billion – or roughly one-third of Skanska's global revenue.

SKANSKA'S FOCUS ON SAFETY

Skanska's purpose is to build for a better society. This core mission led to the commitment to pursue an Injury-Free Environment®, which was launched in 2003 as a way to build a broad safety culture with practical applications. When Richard Cavallaro, then President of Skanska USA, was asked to weigh the obstacles facing the \$10 trillion global Architecture, Engineering and Construction (AEC) industry, he replied "[safety is number one by far.](#)" Given Skanska's company-wide commitment to safety, the internal operations, safety and innovation teams are always looking to improve every stage of the risk monitoring and prevention process.



2112 Pennsylvania Avenue, Washington DC

INTRODUCING SMARTVID.IO

Skanska began piloting Smartvid.io, an industrial photo and video analytics platform in 2016 to manage media captured from diverse sources, such as its drone program or field progress walks. Smartvid.io provides a single location for all photo and video content from current and past projects. Once in Smartvid.io, photos and videos are assigned labels (called "SmartTags") based on their visual content, such as a crane, as well as any accompanying audio content like voiceovers or recordings from field personnel, by leveraging machine learning-powered technology.

When Smartvid.io introduced SmartTags for detecting common safety risks like missing personal protective equipment (PPE), Skanska's innovation and safety teams began exploring how it could apply the technology to its safety programs. Skanska Environmental, Health & Safety Director Jason Timmerman explained:

"We were looking to explore two aspects of our safety program. First, we wanted to validate that the SmartTag technology could pick up on the safety hazards that an experienced safety manager would typically find and help codify best practices and improvement opportunities. Second, we wondered if we could leverage the tagged video to pass along safety knowledge to all personnel on a job, to help them see examples of the risks specific to each phase of their own project. By having an "extra pair of eyes that doesn't sleep" looking at our photo data, we could better identify both positive examples and areas for improvement that we might otherwise miss and grow our safety library. We're also exploring how to tie Smartvid.io technology into our proprietary EHS planning platform called PlanIt, in order to mitigate risk prior to worksite tasks taking place.

Skanska tested Smartvid.io's SmartTag functionality to help with an emerging best practice: capturing narrated videos of project walks at key project phases, highlighting proper implementation of safety practices and potential risks. Using GoPro cameras and/or the Smartvid.io mobile app via an iPhone, site safety managers took videos narrating observed examples of safety best practices and potential hazards. Common examples included Skanska's "ladders last" policy, ensuring clear entry and egress paths, observing crane paths, personnel maintaining safe distance

from heavy equipment, and highlighting proper housekeeping. Team members were also instructed to say terms like "Best Practice" or "Improvement Opportunity" so the video could be searched by relevant audio tags.

IMPLEMENTATION- AUTODESK BIM 360 AND NVIDIA

Skanska then began testing Smartvid.io's integration with Autodesk's BIM 360, which teams have used since 2008 for document management, quality control, and other field activities. Once integrated, jobsite photos stored in the BIM 360 database - whether added by project managers, engineers, or subcontractors - automatically synced to Smartvid.io by project. Next, the SmartTagging engine automatically tagged potential safety hazards like PPE violations (SmartTags included 'Missing Hard Hat' and 'Missing Safety Vest').

HOW IT WORKS (NVIDIA-powered machine learning)

The Smartvid.io Smart Tagging engine, nicknamed "VINNIE", leverages machine learning (also called "Deep learning") technology powered by NVIDIA. NVIDIA's Quadro M6000 and Quadro GP100 boards power the deep learning training and model production hardware used by Smartvid.io to build their vision and speech models tailored to the needs of construction. When Skanska uploads photos and videos to VINNIE, NVIDIA's GPUs power the Amazon cloud services doing the real time analysis. Smartvid.io was selected as one of the top two "most disruptive AI companies in 2017" by NVIDIA from a pool of over 600 candidates.



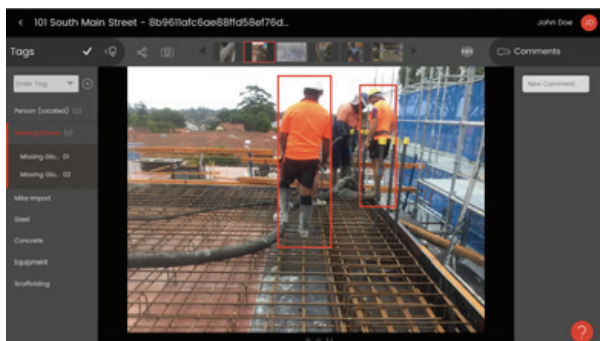
Image tagged as workers having "No high visibility PPE"
(Image courtesy of ENR)

“On today’s construction site, nearly every person has a smartphone they use to capture photos and video, in addition to the many other jobsite monitoring systems such as fixed cameras and drones. Additionally, systems like BIM 360 are collecting massive amounts of photo data from issues, checklists, and other field processes. It is simply not possible to manually review all of the photos in this deluge of data, let alone extract insights or trends over time. Smartvid.io’s photo and video machine learning analytics makes it possible to turn all of those jobsite observations into actionable data for the project team, to ultimately deliver high quality and safer projects,” said Peter Billante, Autodesk’s Senior Manager for BIM 360.

RESULTS

Using Smartvid.io to enable video inspections and analysis of jobsite photos captured in BIM 360 has shown excellent potential for Skanska’s risk monitoring and prevention efforts. Gains included:

- Existing photos in BIM 360 were aggregated and indexed automatically, eliminating time spent on manual organization and retrieval
- Improved jobsite risk analysis by automatically tagging safety best practices and areas for improvement
- Managers could use search and collaboration features to find photos, full videos and video snippets by relevant tags, and share dynamic links to access them with both internal and external colleagues,
- The “video safety job walk” method was found to be promising for communication of phase-specific project risks and for highlighting proper approaches to them. Safety directors used audio tags to pull site-specific visual examples of risk and best practice, filtered by type and phase of project, for safety trainings. Skanska has also created a dynamic library of all these safety and best practice examples to easily retrieve and share for future training use.



*Image tagged as workers having “No gloves”
(Image courtesy of ENR)*

NEXT STEPS

In the next phase, Skanska plans to sync more BIM 360 projects to Smartvid.io and increase the frequency of captured videos in the safety inspection process in order to get more examples of proven practices and improvement opportunities. This will help teams get broader safety coverage of its projects and increase the number of site-specific video examples available for training use.

This pilot has also been a vital step towards a company goal: moving away from project-specific and application-specific data silos, towards a repository of Skanska-wide data across businesses. Skanska has thousands of projects worldwide, all generating large volumes of photo and video content; how might they be used to look backwards and mine years of data for business insights to inform the future of safety, quality, and more?

**ANTHONY COLONNA, Senior Vice President,
Innovative Construction Solutions, Skanska USA**

“Machine-learning and artificial intelligence are exciting tools for an industry that collects a vast array of complex, unstructured data such as images, video and point clouds. We’re on our way to unlocking the potential of that data; from mining insights of historical data to filtering and analyzing data in real-time in order to improve decision-making on the jobsite.”

SKANSKA

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Skanska is one of the largest, most financially sound construction and development companies in the U.S., serving a broad range of clients.

SMARTVID.IO

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Smartvid.io is a software company headquartered in Cambridge, MA which provides machine learning tools for the management and analysis of industrial media.