Construction Safety AI: From the Field to the C-Suite

By Charles Rathmann, Caterpillar, *March 5, 2024*

When contractors think about construction safety technology and systems, they may primarily envision software and devices deployed on site.

Contractors may use software systems to record and report on safety incidents to support their own management decisions and for regulatory reporting. This safety reporting is often supported directly in construction operations software, including field productivity solutions like Raken, Assignar, HCSS Safety or project management tools like Procore, InEight or Autodesk Build.

They may also deploy cameras or Internet of Things (IoT) devices to capture activity on the site and deploy machine vision to document whether safety practices are being followed. Wearable IoT devices from companies including Triax and Eyrus may assist in coordinating workers and crews on a site and capture safety incidents using manual entry, accelerometers and other tech.

Applications that capture imagery for other purposes—like EarthCam's robotic cameras, which are primarily used to document time-lapse progress imagery—are also now delivering AI safety functionality. Earthcam use its archive of images across decades to train their artificial intelligence (AI) to spot and send notifications of unsafe work.

On construction equipment, technologies ranging from intelligent radar motion detection to machine-learning-driven pedestrian detection help prevent safety incidents and may capture data on incidents and near misses. Technologies are also coming to market that use AI to identify not just pedestrians but objects, berms, voids and other pieces of equipment.

While these AI-driven applications often capture data that can be used to look back at what happened, AI is also coming to market that can apply predictive analytics to safety data, helping contractors report on bad things that happen and prevent them before they happen.

In the case of Oracle, which acquired safety AI vendor Newmetrix in late 2022, these predictive insights can increasingly be shared across a broader construction analytics platform in Oracle Construction Intelligence Cloud. This is significant because, rather than being isolated in its own data silo, these predictive safety analytics can be extended for proactive decision support by management.

Construction Safety Predictive Analytics

Newmetrix was a middle-market sized startup at the time of the acquisition, having been founded in 2015 as Smartvid.io. Post-acquisition, Newmetrix is a standard Oracle SKU that can be sold by any Oracle Construction and Engineering sales representative and channel partners. IRONPROS debriefed former Newmetrix CEO and current Oracle Senior Director of Product and Strategy for

Construction Intelligence Cloud Josh Kanner in December 2023.

“We are a part of the broader Oracle Construction Intelligence Cloud analytics and AI team,” Kanner said. “The vision at Oracle is to provide AI and analytics across the key areas of construction delivery risk, from safety to schedule to cost to quality, helping contractors and owners reduce risk and improve their overall project portfolio performance.”

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Kanner has founded other companies that have been acquired by IBM and Autodesk and has come to appreciate the added breadth of an enterprise organization, which in this case gives existing customers an enterprise-level customer success and support organization and stable, secure provisioning on the Oracle Cloud Infrastructure.

“We have now trained up the Oracle customer success team,” Kanner said. “And some Newmetrix customer success folks have come across as well … It’s great to be ... part of that bigger team. I’ve been in a couple acquisitions before, and it’s always great to come in as a part of a broader work, especially when the visions are so well aligned like they are with Oracle.”

Construction Safety AI on OCI

Becoming part of Oracle has increased the total number of customers that the Newmetrix technology can reach, and deep integrations are designed to make it into a core benefit of a broader application set. While the full scope of Oracle’s plan for its new construction safety AI analytics technology is yet to be made public, we are able to share some insights.

“Most recently, the Newmetrix platform, as it exists today, went through an Oracle Security, audit and update process,” Kanner said. “And as a result, is now available as of October through Oracle Systems as a formal Oracle product. That was a big milestone for us, to now be formal Oracle SKU for sales and acquisition and management through all the normal Oracle processes. The next big milestone is going to be next year, where the Newmetrix product is going to be relaunched within Oracle’s Oracle Cloud Infrastructure (OCI) as a part of a broader the broader Construction Intelligence Cloud.”

Oracle has made substantial investments in OCI’s ability to support demanding AI applications. In September at Oracle Cloudworld in Las Vegas, Oracle announced that Oracle Database 23c will support AI vector search. According to an Oracle release, this will “enable the Oracle Database to store the semantic content of documents, images, and other unstructured data as vectors, and use these to run fast similarity queries. These new capabilities also support Retrieval Augmented Generation (RAG), a breakthrough generative AI technique that combines large language models (LLMs) and private business data to deliver responses to natural language questions. RAG provides higher accuracy and avoids having to expose private data by including it in the LLM training data.”

RAG has been praised for increasing the security of LLMs, reducing “hallucinations” or made-up responses. Extending an enterprise database for AI rather than relying on a stand-alone application with its own cloud database, brings additional benefits.

“Oracle Database is the leading repository of business data, and the combination of business data and semantic data is what enterprises need to implement artificial intelligence solutions,” Oracle Executive Vice president, Mission-Critical Database Technologies Juan Loaiza said in the release. “Searches on a combination of business and semantic data are easier, faster, and more precise if both types of data are managed by a single database. By adding AI Vector Search to Oracle Database, we enable customers to quickly and easily get the benefits of artificial intelligence without sacrificing security, data integrity, or performance. Using Oracle AI Vector search does not require machine learning expertise. All database users, including developers and administrators, can learn to use it in less than 30 minutes.”

From a raw compute power standpoint, Oracle also offers the OCI Supercluster AI Infrastructure, which is engineered specifically for demanding AI applications including computer vision, natural language processing and recommendation systems.

“OCI is built in a very modern way with a memory architecture, which allows us to do virtual clustering for AI,” Kanner said. “They’ve called for graphical-processing-unit-based machines, which are basically hive memory-based transaction machines that are used in AI. You’ll hear Larry Ellison talk about the fact that we’re winning business like Uber. And actually, Elon Musk, just for X, bought a massive amount of capacity because of the advantage that OCI has over the other hyperscalers in the area of AI from a cost and performance standpoint.”

Safety AI with Project Management Software

This move will bring benefits to existing Oracle construction customers who gain the Newmetrix safety AI toolset, and to Newmetrix and its existing customers that get new capabilities through integration and bulletproof provisioning as the solution moves from Amazon Web Services (AWS) onto OCI.

“We integrate directly with Oracle products like ACONEX, as well as other construction management products—wherever safety related data might lie,” Kanner said. “And we pull that in through our pre-built integrations that can include safety observation data, safety checklist data—all kinds of structured data. We also pull in progress photos that might be gathered in the field from progress walks. We use all that to build our predictive analytics models for predicting safety risk.”

While Newmetrix can ingest and produce insights from photogrammetry and regular photographs, it is agnostic with respect to what hardware generates the images—which distinguishes it from camera system-based machine vision that may be able to identify safety issues.

“We actually don’t require cameras or any kind of photography at all,” Kanner said. “If you have it, it’s great. It helps with the predictive lift in our predictive models, but it’s not required.”

Rather, Newmetrix can access a broad spectrum of project documents, both inside and outside the Oracle product set, to extract predictive safety insights.

“If you have a project list, and you have observation data, and you’ve got incidents and near misses, that’s a great starting place for the journey to use data to help measure and manage safety in a predictive way,” Kanner said. “One of our core philosophies is that we go get the data where it exists. You might have schedule data with activities in it. You might have manpower data in your field reporting system that tells you different types of manpower on site and the hours they’re there. We’ll go get it and we’ll try and make it work. That’s actually a part of our service—something we call a predictive data assessment, which is a way we go in and work with a customer to assess their data. In essence, we look at what ingredients do they have in the pantry, their data pantry, and see what of those ingredients we can use to build either a benchmarking or predictive analytics approach for safety for them.”

The software automatically transforms the project data into the standard Newmetrix data model for predictive analytics. This requires, according to Kanner, 18 to 24 months’ worth of data.

Customers can harvest these insights from within a web interface. They can use the Computer Vision API to port them into other business intelligence applications.

“Once we’ve done what we do, it’s ready to be consumed,” Kanner said. “It’s either being consumed by someone in our UI, or in some kind of business intelligence UI.”

When used to send data out through APIs to other systems, Newmetrix is more akin to an AI-as-a-service tool than a system of record because it accesses data, transforms it and then relays it to other systems to be actioned.

But in many cases, the data may be going to other products in the Oracle construction portfolio.

“One of the exciting things for Newmetrix is to be a part of the broader Construction Intelligence Cloud. We are the safety predictive engine,” Kanner said. “The Construction Intelligence Cloud works with the other Oracle solutions like Oracle Primavera, the scheduling platform ACONEX, which is a document control and construction management platform unifier for capital programs, and Textura for payments.”

Apart from Oracle solutions, Newmetrix customers will find pre-built integrations with Autodesk; Procore; SharePoint and; for 360-degree imagery, DroneDeploy. As part of Oracle, Newmetrix can harness the power of OCI, an integration platform-as-a-service technology.

“It has a whole bunch of out-of-the-box, pre-built adapters plus an integration framework for adding new ones,” Kanner said. “So that’s actually part of what’s happening with our product. It’s being built into the whole Oracle stack, so we’ll have the ability to use OCI.”