

GOOGLE GLASS 2.0 IS A STARTLING SECOND ACT



Don't call Heather Erickson a glasshole.

Yes, that's [Google Glass](#) on her frames. But she's not using it to check her Facebook, dictate messages, or capture a no-hands video while riding a roller coaster. Erickson is a 30-year-old factory worker in rural Jackson, Minnesota. For her, Glass is not a hip way to hang apps in front of her eyeballs, but a tool—as much a tool as her power wrenches. It walks her through her shifts at Station 50 on the factory floor, where she builds motors for tractors.

No one at Erickson's factory is concerned that the consumer version of Glass, after an initial burst of media glory, was condemned for bugginess and creepiness, then ushered into a gadget version of the Bardo. The original Glass designers had starry-eyed visions of masses blissfully living their lives in tandem with a wraparound frame and a tiny computer screen hovering over their eye. But the dream quickly gave way to disillusionment as early adopters found that it delivered less than it promised—and users became the target of shaming from outsiders concerned about privacy. Within three years, Alphabet (the parent company of Google and its sister company, the “moonshot factory” called X) had given up Glass for good—or so people assumed.

What they didn't know was that Alphabet was commissioning a small group to develop [a version for the workplace](#). The team lives in Alphabet's X division, where Glass was first developed as a passion project of Google cofounder Sergey Brin. Now the focus was on making [a practical workplace tool that saves time and money](#). Announced today, it is called [Glass Enterprise Edition](#).

That's what Erickson wears every day. She works for [AGCO, an agricultural equipment manufacturer that is an early adopter of Glass EE](#). For about two years, Glass EE has been quietly in use in dozens of workplaces, slipping under the radar of gadget bloggers, analysts, and self-appointed futurists. Yes, the population of those using the vaunted consumer version of Glass has dwindled, tired of being driven out of lounges by cocktail-fork-wielding patrons fearing unwelcome YouTube cameos. Meanwhile, Alphabet has been selling hundreds of units of EE, an improved version of the product that originally shipped in a so-called Explorer Edition in 2013. [Companies testing EE—including giants like GE, Boeing, DHL, and Volkswagen—have measured huge gains in productivity and noticeable improvements in quality. What started as pilot projects are now morphing into plans for widespread adoption in these corporations.](#) Other businesses, like medical practices, are introducing Enterprise Edition in their workplaces to transform previously cumbersome tasks.

The difference between the original Glass and the Enterprise edition could be summarized neatly by two images. The first is the iconic photo of Brin alongside designer Diane von Furstenberg at a fashion show, both wearing the tell-tale

wraparound headband with display stub. The second image is what I saw at the factory where Erickson works, just above the Iowa state line and 90 miles from Sioux Falls, South Dakota. Workers at each station on the tractor assembly line—sporting eyewear that doesn't look much different from the safety frames required by OSHA—begin their tasks by saying, "OK, Glass, Proceed." When they go home, they leave their glasses behind.



Left: Frazer Harrison/Getty Images. Right: Courtesy of AGCO.

These Jackson, Minnesota, workers may be onto something. A recent Forrester Research report predicts that by 2025, nearly 14.4 million US workers will wear smart glasses. It wasn't referring to fashion runways. It turns out that with Glass, Google originally developed something with promising technology—and in its first effort at presenting it, failed to understand who could use it best and what it should be doing. Now the company has found a focus. Factories and warehouses will be Glass's path to redemption.

A workplace version is quite a shift for one of the most hyped products in Google's history. Glass first dropped into public consciousness five years ago as the featured product of Google's big I/O conference in 2012. Literally dropped, as thousands of attendees watched a free fall from the point of view of a team of Glass-equipped skydivers hurtling toward the roof of San Francisco's Moscone Center. The elaborately planned stunt set the tone for the launch of a product that was nowhere near ready for reliable use when it was released a year later. Google acknowledged that by calling early buyers "Explorers"—virtual Shackletons who knew they were venturing into a treacherous realm. Still, first impressions were rhapsodic: Time declared Glass one of the best products of the year, and everybody from Prince Charles to Beyoncé clamored to try it out.

But soon Glass's failings became apparent. It was buggy, it felt awkward, and it really didn't have a clear function. Then came a backlash from people interacting with Glass users, who worried that their private moments would be captured by stealthily recorded video. Establishments began banning Glass. The project simply wasn't working.

"When we originally built Glass, the work we did on the technology front was very strong, and starting the Explorer program was the right thing to do to learn about how people used the product," says Astro Teller, who runs the X division. "Where we got a little off track was trying to jump all the way to the consumer applications." He pauses. "We got more than a little off track."

In time, Glass jumped the track entirely, going dark in January 2015. Its website read, "Thanks for exploring with us"—and that seemed to be the finale, even as the company also promised, "The journey doesn't end here."

In fact, a different journey had already begun. Even as the sound of breaking Glass was reverberating in the tech press, some early adopters were discovering that Glass was a powerful solution to a problem vexing the workplace. Workers who need real-time information—and both hands free—were natural beneficiaries of what Glass had to offer, even if Google hadn't figured that out yet.

It's a choice between an immersive form of augmented reality, which overlays digital information on top of the real world, and an alternative that lets workers shift between the virtual and the actual. Some companies in the enterprise sector have been singing the praises of "mixed reality" helmets that overlay graphics and information onto a camera-captured display of the real world. But these are costly, bulky, and not well suited for routine tasks on a factory floor. In cases when all a worker needs is real-time access to information, a big helmet that takes over your entire field of vision is overkill. Smart glasses are a lightweight version of augmented reality—some people call this "assisted reality"—offering a computer display that one could view simply by shifting one's gaze and taking in the rest of the world as it is. It's cheaper and more comfortable than going full immersive.

Without direction from Google, these companies began to purchase Explorer Edition units of Glass and use them with custom software to tackle specific tasks for their corporate customers. And Google noticed.

"We talked to all of our explorers and we realized that the enterprise space had a lot of legs," says Jay Kothari, who now is project lead on the Glass enterprise team. Also noticing was Brin himself, who, according to Teller, reported the interest from corporations and suggested that a dedicated team might work on a specialized version of Glass to serve them. In April 2014, Google started a "Glass at Work" program that highlighted some of the early developers. And that year when a few people from X visited Boeing, which was testing Glass, they reported that their minds were blown by a side-by-side comparison of workers doing intricate wire-framing work with Glass's help. It was like the difference between putting together Ikea furniture with those cryptic instructions somewhere across the room and doing it with real-time guidance from someone who'd constructed a million Billys and Poängs.



PHOTO COURTESY OF GOOGLE

The company decided to work on a version of Glass that would be totally separate from the consumer version. Then came the tricky part of where that team might live. Glass had supposedly "graduated" from X, but Alphabet put the Enterprise team back there. One reason was that an ace engineer named Ivo Stivorac was now a senior director at X. Stivorac had been steeped in wearables for almost two decades, co-heading a lab at Carnegie Mellon and cofounding a company called BodyMedia that was bought by Jawbone. "He literally was doing this 20 years ago," says Teller. Also, the head of X's rapid evaluation team, Rich DeVaul, had a background in wearables.

The eventual customers for this new version—from small businesses to huge corporations—had already been dealing with independent startups that adapted Glass for specific workplaces. The Glass team at X formalized that structure, creating an ecosystem that would support "solution partners" who would work with the Glass Enterprise team directly, including buying the actual devices from Alphabet. The partners would then sell the complete hardware and software package to corporate customers. The main task of the Enterprise team in X was creating a new model of Glass itself, improved for the rigors of the workplace and optimized with new features that the customers were clamoring for. In January 2015, they began shipping the resulting Enterprise Edition to the solution partners. Perhaps because of the unhealed wounds of the consumer fiasco, Google asked customers not to reveal the existence of EE. (Any pictures of their use of Glass had to show them using the Explorer Edition.)

Those still using the original Explorer Edition will explode with envy when they see the Enterprise Edition. For starters, it makes the technology **completely accessible for those who wear prescription lenses**. The camera button, which sits at the hinge of the frame, does double duty as a release switch to remove the electronics part of unit (called the Glass Pod) from the frame. You can then **connect it to safety glasses for the factory floor—EE now offers OSHA-certified safety shields—or frames that look like regular eyewear**. (A former division of 3M has been manufacturing these specially for Enterprise Edition; if EE catches on, one might expect other frame vendors, from Warby Parker to Ray-Ban, to develop their own versions.) “We did a lot of work to lighten the weight of the frames to compensate for the additional weight [of the Pod],” says Kothari. “So the overall package with Glass and the frames itself actually comes out to be the average weight of regular glasses.”

Other improvements include **beefed-up networking—not only faster and more reliable wifi**, but also adherence to more **rigorous security standards—and a faster processor as well**. The **battery life has been extended—essential for those who want to work through a complete eight-hour shift without recharging**. (More intense usage, like constant streaming, still calls for an external battery.) The camera was upgraded from five megapixels to eight. And for the first time, a **green light goes on when video is being recorded**. (Inoculation against Glasshole-dom!)

“It looks very similar to original Glass but improves on every aspect of it,” says Brian Ballard, CEO of Upskill, one of the most prolific of the so-called solution providers. “They had seen how we were using it, and rethought everything—how you charge it, fold it up, prevent sweating, wifi coverage.” Ballard says that the new version was essential for the pilot programs his big customers were running to become fully integrated into the workflow. “For our market we desperately needed a product with a brand like Google behind it. Our customers don’t buy things from Kickstarter.”

Today’s announcement, which frees corporate users from keeping silent about the EE edition and opens it up to countless more businesses, is a milestone in the resurrection of a technology left for dead. “This isn’t an experiment,” says Kothari. “It was an experiment three years ago. Now we are in full-on production with our customers and with our partners.”

Yep. Glass is back.

I saw Glass in action myself when I visited the AGCO factory in Jackson this month. AGCO is a \$7 billion company that makes big farm equipment like tractors and sprayers under brand names like Challenger and Massey Ferguson. Its Jackson facility, which added the tractor assembly line in 2012, is a fairly high-tech operation, with a few autonomous robot carts roaming the aisles. 850 people work there. The expensive equipment that AGCO manufactures is most often custom-ordered by the user, so almost every unit constructed is a “snowflake” with a virtually unique set of features. In order to **keep track of the specifications of each vehicle**, AGCO originally had its workers consult laptops—which required a walk of about 50 feet and disrupted the work flow. “Sometimes someone was already using the computer, and then you’d have to find another,” says Heather Erickson. **The company experimented with tablets, but even the heavy-duty industrial ones it bought typically lasted only a week in the punishing environment.**

Then someone suggested to **Peggy Gulick, the director of business process improvement** in Jackson, that AGCO try out this new thing called Google Glass. Gulick convinced her boss to buy a single Explorer unit. They got it in 2013 and were encouraged by its potential. It also seemed sturdier than a competitor in the marketplace, Vuzix’s Smart Glasses. But to adapt this consumer device to their workplace, they’d need a solutions provider. After weeks of trying to find one, and wasting a few months with one that didn’t work out, she finally connected with a **Belgium-based company called Proceedix**.

Working with Proceedix, AGCO began to tackle all the potential issues, from security—the Explorer couldn’t connect to an enterprise network—to device tracking and safety. “We weren’t going to risk our employees’ having headaches and other issues,” she says. (Indeed, some workers reported headaches before they got used to it.) All of that took months, but AGCO believed it would be worth it. “We knew the value of wearable technology when we first put it on the floor,” Gulick says. **“In our first test in quality, our numbers were so high in the value it was adding that we actually retested**

and retested and retested. Some of the numbers we couldn't even publish because the leadership said they looked way too high.”



PHOTOS BY STEVEN LEVY

Watching workers on the floor, you can't always tell how much Glass is integrated into the process. You simply see people getting parts, bolting, ratcheting, and attaching—every so often swiping and tapping the side of their glasses. Once you see examples of what those workers are seeing, though, Glass's advantages become more clear. A typical task at AGCO takes 70 minutes, broken into steps of three to five minutes. When a worker begins a step, it's spelled out on the tiny screen. Menu items offer the options to go to the next step, take a picture, ask for help, and more. When a step is done, the worker says, "OK, Glass, proceed," and the process repeats.

For tasks they have mastered, workers don't need to look at the screen. But they can wake it at any time to see where a part must go, and even zoom into an object on the display for more detail. Glass tells them what kind of bolt is needed—a wrong-sized bolt could seriously damage a motor—and specifies which wrench to use and how much torque is required. If a part looks damaged, they can take a picture. Some workers prefer to swipe along the side of the frame to go to the next step; others work mainly via voice commands.

Gulick says that not everyone has warmed equally to the process—some older, very experienced workers originally didn't see how it would help them. "There was initial skepticism, but we got over it," says Scott Benson, who assembles transmissions. And though a factory is not a cocktail lounge, privacy issues still come up. Gulick says there's been discussion of installing a "bathroom bar" where people can hang their headsets to make sure that no one is snapping photos. But generally the **workers simply accept Glass as part of their toolkit.**

In fact, they have to. "It's like a torque tool," says AGCO's Rick Reuter, who is the Continuous Improvement Manager in Jackson. "It's required to use a torque tool to torque down the lug bolts on a tire—if you don't do it, you're not following the process. Now, it's required to go through these electronic work instructions as part of your job. So the acceptance is a whole lot more different here than it would be for the public."

Some workers are outright enthusiasts, like Heather Erickson. When she was moved to a different station where the Glass process wasn't implemented yet, after a few hours she went to Peggy Gulick's office and asked to speed up the deployment.

AGCO now has just over a hundred Glass units (it pays between \$1300 and \$1500 for each one), and Gulick says that it plans to order between 500 and 1000 more in the next 18 months as it moves the product into all its functions and in other locations. **The company is particularly excited about how Glass helps with training—cutting the time from 10 days to only 3.**

When a company like AGCO embraces new technology, one naturally wonders how far it might take automation—and what that means for jobs. AGCO’s executives think Glass helps tamp down such suspicions. **“We’re not using this to replace workers with a robot that does their job better—we’re helping them do their job better,”** says Gulick.

That’s a theme that other early customers of Glass EE are promoting. Upskill’s executive chairman and the chief economist of one of its customers, GE, co-authored a paper last month in Harvard Business Review entitled **“Augmented Reality Is Already Improving Working Performance.”** **“There’s been concern about machines replacing human workers...”** they wrote. **“But the experience at General Electric and other industrial firms shows that for many jobs, combinations of humans and machine outperform either working alone. Wearable augmented reality devices are especially powerful.”**

GE in particular has been enthusiastic in its Glass tests, claiming a **46 percent decrease in the time it takes a warehouse picker using the product.** (Using Glass in this environment is as transformative as in factories—after a successful test, DHL says it plans to roll out Glass in its 2000 warehouses across the globe, where appropriate.) Another pilot project, in GE’s Aviation Division, used EE with a wifi-enabled torque wrench: Glass tells workers whether they are using the proper amount of torque. Eighty-five percent of the workers said that the system would **reduce errors.** **“By the end of this year, we’ll have several sites deploying this,”** says Ted Robertson, an engineering manager at GE Aviation.

It’s not just blue-collar labor getting results with Enterprise Glass. When engineer and self-described “medical device guy” Ian Shakil first saw a prototype of Glass from some Google friends in 2012, he quit his job and started a company called Augmedix to **use the technology to make medical examinations more productive—and more satisfying for patients and doctors alike.** When seeing patients, the doctor using this system wears Enterprise Edition glasses and livestreams the entire examination to a “scribe” who may be a pre-med student taking a year off before medical school or, more commonly, a medical transcriptionist in India, Bangladesh, or the Dominican Republic. The scribe takes notes during the exam and, when appropriate, accesses the patient’s case history to provide relevant past readings, freeing the doctor to concentrate on the patient.

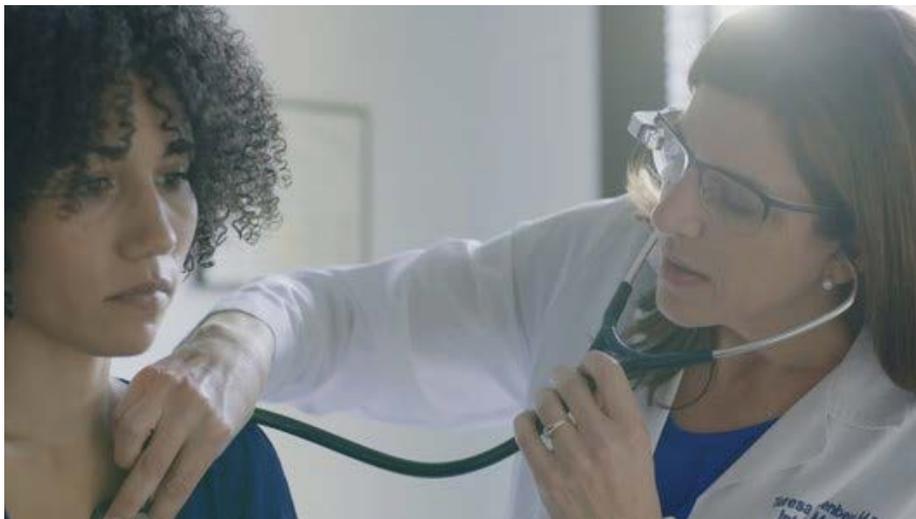


PHOTO COURTESY OF AUGMEDIX

“The total time entering data has gone from 33 percent of our day to less than 10 percent,” says Davin Lundquist, the chief medical information officer for Dignity Health, who uses Augmedix and Glass himself in clinical work. **“And direct patient interaction has risen from 35 percent to 70 percent.”**

Lundquist’s enthusiasm for Glass underlines an irony: The very features that triggered criticism of the consumer version of Glass—the stealthy introduction of external information into real-life settings; the ability to record videos of bystanders unobtrusively—become the most valued features in the Enterprise Edition. **“When you hear the word Glass, you think dehumanization, social disruption,”** says Shakil. **“We’re the opposite—being close to the patient; being able to put your hand on his or her shoulder to comfort them.”**

Why does Glass work so well in those private settings when it so totally flopped in public? Perhaps because in the enterprise world, Glass is not an outgrowth of the intrusive and distracting smart phone, but a tool for getting work done and nothing else. The Enterprise Edition runs only the single application necessary to do the job. There's no Facebooking, Tweeting, Snapping, notifications, or rage-generating headlines. "Glass in an enterprise setting is not a toy," says Lundquist. "It's a tool that enhances our ability to perform as professionals."



An Augmedix scribe at work. COURTESY OF AUGMEDIX

Has the doctor ever had patients who associate his eye rig with the consumer product that earned users a certain distasteful rectal sobriquet? "I haven't had anyone who brought that up," he says. "My younger patients ask, Is that Glass? I let them try it out. In most cases my patients feel that it sets me apart as a cutting-edge doctor."

Of course, cutting-edge was what the original Glass was supposed to be—before Glass itself got cut. Will success in the workplace lead to a revival of the consumer edition? So far, the Enterprise effort is being run totally separate from what's left of the consumer project. Though I tried hard to press Alphabet for a straight answer on the status of the latter effort, if indeed there is a status, all I got was an indication that between X, the Google Cloud division, and Google's hardware division, there is an intent to keep the vision alive.

"None of us have given up on the idea that over time Glass will become less and less intrusive, and that more and more people will use it," says Teller. "But we're not going to prejudge exactly what that path is—that's where we went wrong last time. We'll focus on the places that are actually getting value out of that and go through the journey with them, being open-minded about where it's going to go."

Maybe Google should consult Ken Veen, a quality checker in the AGCO factory in Jackson. He's been using Glass EE for two years there as he tests tractors just off the assembly line. "Before, when I saw a problem, I'd have to write stuff on paper, then go to the computer and type it up," he says. "Now I hit NOT OK and describe my problem, and it goes right to [the quality team]."

Would he be interested in using Glass in his daily life? "I might be," he says, after some consideration. "I could wash dishes and check my email. That could come in handy." And then he goes back to testing tractors.

Proceedix enables operational excellence through empowered & connected people, executing work instructions and inspections with mobile and wearable technology, including the new Google Glass Enterprise Edition.

Some of the demonstrated benefits so far:

- reduce safety-related risk
- achieve 100% adherence to standardized work
- achieve 100% compliance with critical safety, quality and maintenance procedures
- significantly reduce setup and changeover times, while eliminating setup mistakes
- dramatically improve quality levels and first-time-right performance
- dramatically reduce quality-related rework and waste
- improve productivity of operators, quality inspectors, and maintenance technicians up 30%
- reduce back-office administrative time up to 20%
- increase the picking/kitting speed of your warehouse team up to 40%
- reduce training time up to 70% while increasing operator skill levels and performance
- significantly increase worker satisfaction
- significantly increase continuous improvement contribution
- be a more attractive employer to the millennial workforce

AGCO (www.agcocorp.com) is one of the earliest adopters of wearable technology for shopfloor applications. They started their efforts before the release of Glass Enterprise Edition, and invested a few years pioneering things, figuring out security issues, OSHA compliance, ergonomics, etc., in close collaboration with Proceedix. In the meantime, the technology has been refined, proven, and put into production. A proof-of-concept now can be done very affordably and with very little risk, in just a couple of weeks. A pilot implementation can be done in a few months. After which you can be self-sufficient for further roll-out across your organization.

For some more information about the Proceedix technology at AGCO, see e.g.:

article: [AGCO Innovations in Manufacturing with Glass](#)

article: [AGCO First Agricultural Manufacturer to Receive the AME Excellence Award](#)

video: [Google Glass on the Manufacturing Floor using Proceedix \(2'16"\)](#)

video: [The Connected Enterprise \(17'00"\)](#)

video: [Wearable Technology in the Lean Enterprise \(17'33"\)](#)

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