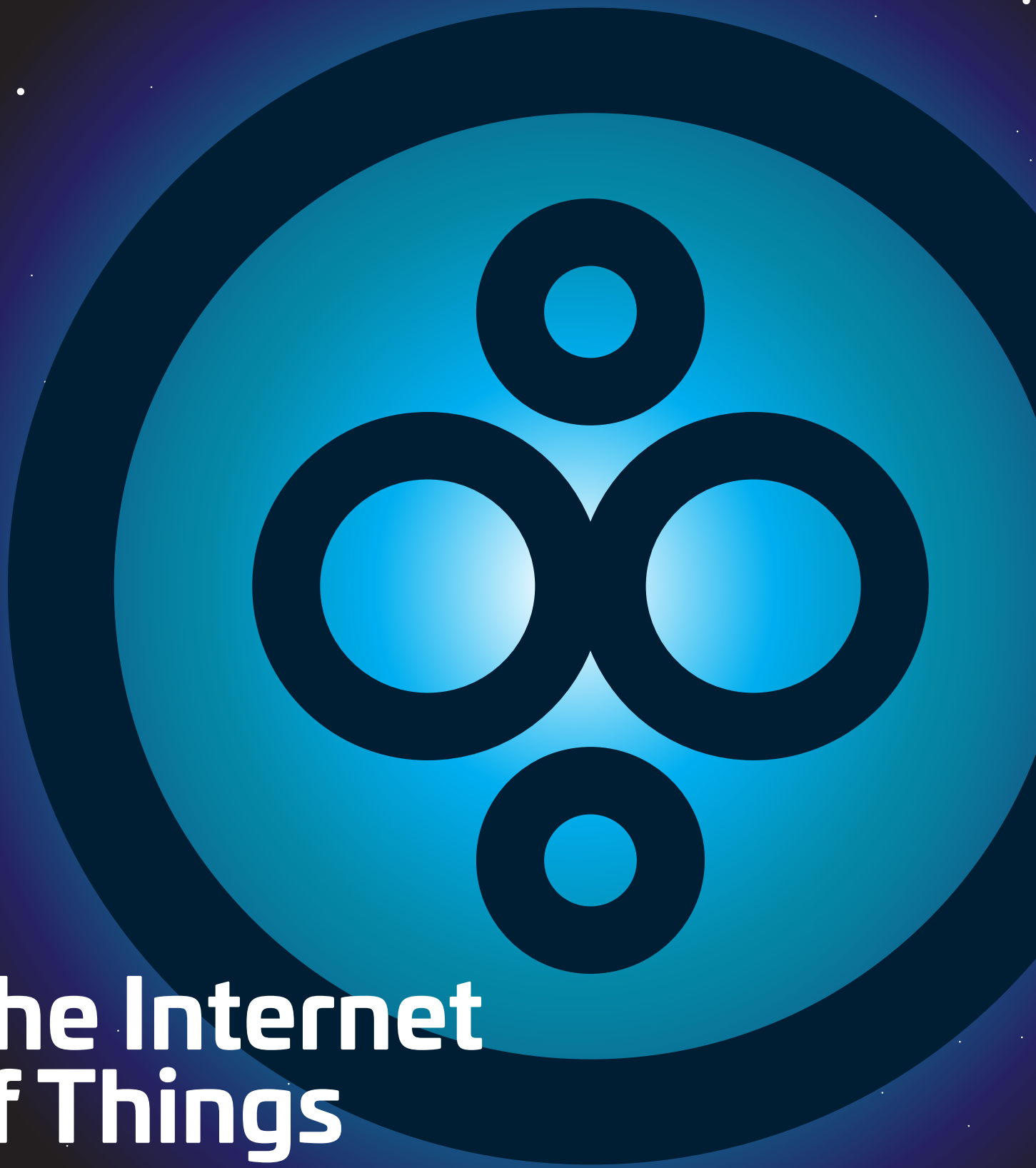




# The Internet of Things

connecting the job  
site like never before

BuiltWorlds.com

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There's no doubt about it – projects can be incredibly complex. With so many players within the mix visiting the job site, including the owner, PM/owner's rep, GC, A&E and specialty contractors, it's hard to always know who's on first and who's responsible for what, where and when. Although the owner's rep is usually charged with monitoring the overall project activities and the GC is typically responsible for the actual management of these activities, every individual plays a critical role.

And don't forget the stakeholders. Typical key project stakeholders are those with any interest in your project's outcome and they typically include the members of a project team, project managers, executives, project sponsors, customers and end users.

No matter what the role is, all of these players have the same overall goal: to get the project done – on time and on budget. And fortunately, with a little (well, actually a lot) of help from the Internet of Things (IoT), today's project sites are not only better connected than ever, they are also much safer, smarter, efficient and cost effective as a result.

That's because, through the IoT, it's not just the people on the jobsite who are connected – it's practically everything related to the project itself, including equipment, products, tools and the overall environment.

## Internet of Things defined

So, what exactly is the Internet of Things? The IoT refers to the network of physical objects (devices, vehicles, equipment, homes, buildings) that are connected to the Internet through embedded devices and software, which allows these physical objects to collect, analyze and exchange data. This includes everything from cellphones, coffee makers, washing machines, headphones, lamps, wearable devices and almost anything else you can think of. This also applies to components of machines, for example a power drill or construction tool.

According to analyst firm Gartner, there will be over 26 billion connected devices by the year 2020 (with some estimating this number to be much higher – over 100 billion). And McKinsey Global Institute researchers estimate the potential economic impact of IoT technologies to be USD\$2.7 trillion to USD\$6.2 trillion annually by 2025.

## Connecting teams and increasing productivity

With so many players on the project site, having these new technologies accessible – often times at your fingertips – has connected project teams like never before. Through the IoT, sensors are being deployed literally above, across and beneath job sites to collect massive amounts of data on job sites on an ongoing basis. Practical examples of how the IoT is leveraging this data to increase productivity across the construction industry include:

- **Aerial scanning / monitoring:** Through drones and satellites, construction companies can build knowledge into their projects and execute site monitoring missions so easily and safely that it becomes a daily routine, reducing costs and project delays.
- **Equipment servicing and repair:** Sensors in machines alert you when they are in need of repair or maintenance. They also let you know when it's time to perform preventive maintenance, saving you lots of money in the long run.
- **Construction tools and equipment tracking:** It's hard to run a business when equipment moves between yards, sites and projects and your crew is too busy to track assets or equipment. Sensors help communicate where your tools and equipment are in real-time.
- **Replenishing inventories:** RFID tags can tell you in real-time when you are running low and need to order more of a certain item. By giving the heads up that supplies are running low, you can prevent job delays or hold ups.
- **Providing safe work environments:** Wearable augmented reality hardware and software detects, alerts and helps prevent hazardous work related incidents.
- **Real-time tracking of employees:** Sensors automate time and GPS labor tracking, job costing and documentation, as well as provide real-time information that helps companies become more efficient, productive and profitable.
- **Ground level scanning / monitoring:** With quick and easy scanning, job sites can be captured daily or weekly to gain powerful insights into projects and prevent rework.

## Capitalizing on the IoT trend

When you consider the possibility of connecting any machine, any system or any site to the Internet to know at any time what's happening, it rapidly becomes clear the positive impact the IoT can have on the construction industry. And there's no shortage of emerging technology companies who are capitalizing on this trend. Below is a list of companies by category that are revolutionizing the project site as we know it:

### Drones/satellites

**DroneDeploy:** a cloud-based drone mapping software that enables its customers to collect and analyze aerial data using any type of drone

**Kespry:** a provider of automated drone systems that allows companies to easily capture, view, analyze and share aerial data

**Uplift Data Partners:** Uplift's drone pilot network and turnkey data service helps industry leaders prevent rework, reduce waste, increase safety and boost margins by capturing and analyzing aerial data

**SiteAware:** Formerly known as Dronomy, SiteAware's autonomous drones help construction companies build knowledge and obtain actionable data of their construction projects and job sites

**AeroVista Innovations:** an UAV service company specializing in aerial media production services for construction mapping and BIM, infrastructure inspections, insurance assessments and more

**Unearth Labs:** Unearth's collaboration software connects your people, places and plans - blueprints, specifications, spatial measures and more - in real-time

**Hangar Technologies:** Hangar's data acquisition platform helps firms integrate aerial data into their operations without having to handle owning, acquiring, flying or editing the data from drones



### Spotlight on SiteAware – delivering accurate and precise job site data

Accurately monitoring a construction site takes precision and focus. Using autonomous drones, [SiteAware](#) (formerly Dronomy) provides general contractors and owners with visual analytics of their projects by uniquely and frequently capturing job site data and analyzing it into actionable information that is shared over the cloud to all relevant project stakeholders.

With its stack of technologies, [SiteAware](#) transforms off-the-shelf drones into powerful construction tools, delivering the most precise and comprehensive construction site data. These drones not only fly above construction sites, but also inside construction sites and around structures – which can be a real challenge considering all the obstacles. Flying low and close provides much greater detail on a project, which leads to better precision and accuracy and opens a realm of analysis capabilities not possible otherwise.



The company's breadth of analysis tools is also unique. Once a site is scanned, they are able to overlay and superimpose two 3D scans and then automatically identify changes between those 3D models. [SiteAware](#) also performs continuous validation of the actual "as-built" model to the BIM, ensuring deviations, errors and delays are found early on. Being able to identify errors early on through these types of tools translates into a lot of efficiencies and savings realized in the long run.

With [SiteAware](#), analyzing, monitoring, and sharing site details becomes part of the daily site routine, connecting job sites like never before. Construction companies can build knowledge into their projects and execute site monitoring missions so easily and safely – all while reducing costs and project delays as they go.

## Tools & Equipment

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**5D Robotics:** provides state-of-the-art hyper-positioning and autonomous navigation platforms that can transform any existing vehicle into a smart, precise and safe autonomous vehicle

**Apis Cor:** Apis Cor's mobile construction 3D printer is capable of printing whole buildings completely on site

**Construction Robotics:** has developed SAM100, a robotic bricklayer for onsite masonry construction

**ShareMyToolbox:** a mobile-first application that connects employees to the company's tool catalog

**FalconBrick:** an end-to-end mobile solutions provider that allows users to accelerate projects and streamline their construction cycle

**Endless Robotics:** produces robots that can paint buildings and take care of other finishing works

**GPS Insight:** provides GPS tracking for equipment, fleets of vehicles and other mobile assets

**Truck IT:** allows users to have real-time information as to what dump trucks are available in their marketplace, when they need them

**Digital Fleet:** a cloud-based, customizable telematics platform designed for GPS asset tracking, providing companies with real-time vehicle tracking solutions

**MX3D:** MX3D's robotic 3D print technology prints steel bridges and other metal structures

## People

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**Rhumbix:** uses crew telematics to capture field data in real-time from worker's smartphones in order to increase construction productivity and safety

**Triax Technologies:** has developed spot-r, a wearable technology that provides real-time visibility into the worksite, resulting in faster response to injuries, improved safety performance and increased productivity

**GuardHat:** a multi-product, professional-caliber, feature-packed intelligent safety system that integrates cutting-edge wearable technology and advanced proprietary software

**DAQRI:** produces AR technology to be used on the jobsite, such as smart glasses, hard hats and other intelligent gear

**busybusy:** allows users to track their team and equipment from a mobile device and eliminates paper time cards, improves job costing and simplifies the payroll process

**RealWear:** produces a voice-driven, head-mounted solution to create connected industrial workers

**XOEye:** develops wearable computing technology that provides real-time visual and audible intelligence for the field service industries

**Eyurus:** invisibly registers, records and reports tradespeople entering and exiting the work site, providing positive worker identity verification while sending all stakeholders real-time trade deployment data

**RedPoint Positioning:** RedPoint Positioning's wearable technology alerts construction jobsite personnel when workers are entering pre-defined hazard zones

## Materials

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**Intelliwave (SiteSense):** produces mobile-based software solutions for identification and tracking of construction materials

**Jovix (Atlas RFID Solutions):** uses technology to collect, process and present important information to prevent material readiness issues and manage your project

**BellHawk:** uses mobile data collection, barcode scanning and printing technologies to provide real-time inventory and operations tracking

**Ramp:** provides wireless RFID solutions for real-time tracking, locating and management of assets, inventory, equipment, vehicles and people

**Track'em:** using barcode, RFID and GPS technologies, Track'em provides material, quality, progress and time control systems to track your resources

**Concrete Sensors:** Concrete Sensors' technology is embedded in concrete prior to pouring and connects with a smartphone to tell the strength and drying time of concrete

**Tenna:** formerly known as BuildSourced, Tenna software integrates with GPS asset tracking solutions track location, usage and service history, maintenance schedules and documentation

## Environment Monitoring / Cameras / Gate Monitoring

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**Pillar Technologies:** Pillar's sensors detect smoke, dust and other air issues so workers can pinpoint problem areas on the jobsite

**WeatherBuild:** leverages weather data, machine learning and predictive analytics to increase productivity, enhance safety and manage risk

**Global Contractor Guardian:** using wireless sensors, Global Contractor Guardian builds a virtual fence around a jobsite to detect unauthorized entry, smoke, heat, high water levels and more

**TrueLook:** TrueLook's construction camera combines live jobsite viewing, project time-lapsing and HD security recording

**SENSR:** SENSR's structural monitoring solution helps clients ensure the safety and stability of their critical structures

**MSite:** a construction gate monitor that ensures site adherence to company safety and security policies

**Soloinsight:** provides technology solutions using an identification platform of integrated software and sensors to help customers manage critical resources while maintaining compliance

## Ground level scanners

**HoloBuilder:** HoloBuilder's scanners offer construction professionals and real estate agents the opportunity to create and share 360° views of their buildings

**Paracosm:** a 3D mapping software company that develops mobile reality capture, progress monitoring and visualization solutions

**StructionSite:** makes construction documentation software so builders can share photos and create a Google Street-View

**Matterport:** a media technology company that builds 3D media solutions that allow users to easily create, modify, navigate and build on digital representations of real places

**Imerso:** builds 3D scanning solutions for mobile devices

## Information overload?

Having all of this information at your disposal definitely has its advantages. But it can also result in information overload if not integrated and assimilated in a way that drives better and more efficient projects. There are definitely versions of software that integrate data streams here and there, but we have yet to see a company that offers a solution that brings all of these different data streams seamlessly together onto one platform. Considering the rapid pace of technological growth, however, surely it's only a matter of time.

Until then, the only limit in finding uses for the IoT is our own imaginations. The IoT will continue to revolutionize the construction industry by adding exponential value above, across and beneath the job site, while better connecting people, equipment, products, tools and overall environment like never before.



## Spotlight on IrisVR – bringing your space to life

Imagine walking your client through their new space in a virtual reality setting. You can show them different layouts, color and pattern options, and furniture schemes – all without building anything.

Now, imagine you are bidding for a new piece of business and you really want to 'wow' your potential client. Using [IrisVR's](#) technology, you can communicate your proposed designs and renderings with VR so that the prospect can get a much more authentic sense of what you're proposing.



Founded four years ago, [IrisVR](#) creates software that helps give users a true sense of depth and space before anything gets built. They offer two products. Prospect takes common 3D model formats (like Revit or SketchUp) and automatically converts them into VR experiences with one click. And Scope, their mobile app, allows users to view and share rendered panoramas in VR. Allowing a client to explore their project in virtual reality instantly enables them to make decisions faster, better connect across their project team, and to save time throughout the design and construction process.

Here's what [IrisVR's](#) clients had to say:

"VR has quickly become an essential asset for our office. We have used it to advance design, assess spatial quality, and demonstrate projects to clients. It has also allowed our clients to make slight changes that they may not have otherwise caught, such as extending a bar area, adjusting the wallpaper patterns, or increasing a space's height. The excitement of virtual reality has also aided the client in presenting the designs to investors and most definitely assists us in conveying our ideas."

– StudioMB Architects

"The use of [IrisVR](#) allowed one of our customers to quickly make a decision, explore alternate designs, and move on to the next steps. It was productive as the team realized several different issues in VR that were a lot harder to spot on-screen. Those issues were realized mostly as the result of the better understanding of scale that VR offers and ability to study issues with line of sight."

– Mortenson Construction

One of the best aspects of [IrisVR's](#) software? Both Prospect and Scope are incredibly easy to use.. Armed with the right hardware, no special training is required for this emerging technology company's out of the box software.

[Check out this video to see IrisVR's cutting-edge technology in action.](#)

## 1 Drones/Satellite

[DroneDeploy](#)  
[Kespry](#)  
[Uplift Data Partners](#)  
[SiteAware](#)  
[AeroVista Innovations](#)  
[Unearth Labs](#)  
[Hangar Technologies](#)

## 2 Tools & Equipment

[5D Robotics](#)  
[Apis Cor](#)  
[Construction Robotics](#)  
[ShareMyToolbox](#)  
[FalconBrick](#)  
[Endless Robotics](#)  
[GPS Insight](#)  
[Truck IT](#)  
[Digital Fleet](#)  
[MX3D](#)

### 3 People

- [Rhumbix](#)
- [Triax Technologies \(spot-r\)](#)
- [GuardHat](#)
- [DAQRI](#)
- [busybusy](#)
- [RealWear](#)
- [XOEye Technologies](#)
- [Eyrus](#)
- [Redpoint Positioning](#)

## 4 Materials

- [Intelliwave \(SiteSense\)](#)
- [Atlas RFID Solutions \(Jovix\)](#)
- [BellHawk Systems](#)
- [Ramp](#)
- [Track'em](#)
- [Concrete Sensors](#)
- [Tenna](#)

## 5 Environment Monitoring/ Cameras/Gate Monitoring

[Pillar Technologies](#)  
[WeatherBuild](#)  
[Global Contractor Guardian](#)  
[TrueLook](#)  
[SENSR](#)  
[MSite](#)  
[Soloinsight](#)

## 6 Ground Level Scanners

[HoloBuilder](#)  
[Paracosm](#)  
[StructionSite](#)  
[Matterport](#)  
[Imerso](#)



## The Internet of Things on the Jobsite

45 companies and tools making the connected jobsite a reality.

