



REPORT

MOBILE DEVICE MANAGEMENT AND (IOT) IN CONSTRUCTION INDUSTRY



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Introduction

The construction industry refers to the building of edifices and infrastructure in the following sectors: residential, commercial, environmental and energy, industrial, transportation and defense. Construction projects are typically designed, coordinated and supervised by construction managers.

Construction Industry is one of the most booming industries in the whole world. This industry is mainly an urban based one which is concerned with preparation as well as construction of real estate properties. The repairing of any existing building or making certain alterations in the same also comes under Construction Industry.

In general, there are three sectors of construction industry: buildings, infrastructure and industrial. Building construction is usually further divided into residential and non-residential (commercial/institutional). Infrastructure is often called heavy civil or heavy engineering that includes large public works, dams, bridges, highways, railways, water or waste-

water and utility distribution. Industrial construction includes refineries, process chemical, power generation, mills and manufacturing plants. There are also other ways to break the industry into sectors or markets.

Construction companies are in business to earn a profit, and those who supervise construction work have an enormous impact on the profitability of construction work. Competition is intense and risk is high in the construction industry; but there are tremendous rewards for those who can manage in such a way as to be successful. There are a variety of people who comprise the construction team on projects: owner, architect, engineer, consultant, construction manager, prime contractor, subcontractor, sub-subcontractor, materials suppliers. Effective supervisors, those who can consistently fulfill project objectives in the complex and demanding environment of the construction industry, have a bright and rewarding future in the industry.



Market Size of the Industry

Construction is a major contributor to the U.S. economy. The industry has more than 650,000 employers with over 6 million employees and creates nearly \$1 trillion worth of structures each year. Construction is one of the largest customers for manufacturing, mining and a variety of services.

Investments to modernize the country's aging infrastructure and renewable energy sector, alongside the growing population which will generate demand for residential buildings, will be part of a number drivers of this growth.

The future of the construction industry looks good with opportunities in residential, non-residential, and infrastructure. The major drivers for the growth of this market are increasing housing starts and rising infrastructure due to increasing urbanization and growing population.

Emerging trends which have a direct impact on the dynamics of the construction industry include increasing demand for green construction to reduce carbon footprint, bridge lock-up device systems to enhance the life of structures, building information systems for efficient building management, and the use of fiber-reinforced polymer composites for the rehabilitation of aging structures.

According to a report by [Satista.com](https://www.satista.com), the United States is the one of the largest construction market worldwide, with expenditures reaching over 1,162 billion U.S. dollars. Within the United States, most new construction projects are coming on stream in New York, which tops the list regarding construction expenditure in American cities. Bechtel is currently one of the largest U.S.-based construction firm. The construction and engineering company is headquartered in San Francisco and was one of only two North American companies to make it into the top fifteen list of the world's largest construction contractors, based on 2015 revenues. This particular ranking was dominated by Chinese and European contractors.

In the United States, private construction spending reached around 824 billion U.S. dollars in 2015. New construction put in place is forecast to reach almost 1.4 trillion U.S. dollars by 2020. After the collapse of oil prices, the demand in the engineering and construction sector has slowed. Political and policy changes under the new White House government will also inevitably alter the construction industry. A downturn in business across the national construction industry will likely see companies focus more heavily on the South and Midwest regions. Aging infrastructure has also become a greater concern in the U.S. and a focus on updating infrastructure is expected.

Mobility/IoT in Construction Industry



Mobility is the number one technology trend that construction companies will be focusing on in 2018 and beyond. Three key factors are driving the demand for mobile technology in the workplace: executive demand, an increasingly mobile workforce, and the growing need for real-time information

Also the Internet of Things (IoT) offers a range of applications to the construction industry. Ten years ago, there were six billion connected devices online. There are now 15 billion. The expanding power and capability of IoT has allowed a drastic surge in network communication solutions within the construction industry; saving money, implementing well-regulated processes, and protecting the safety of workers.

The use of mobility and Internet of Things in construction industry is modernizing the entire construction industry from roadways to railways and offices to homes. This innovative style of construction is giving more control over the assets and employees to optimize the entire process of construction with better energy usage, resource allocation, and assets management.

Mobility and IoT is completely transforming the ways we use to develop big building structures with the Internet, connected devices, M2M communication,

and real-time access of the information. Telematics, asset tracking, and heavy equipment management is taking the construction industry to a new level.

The information from all connected machines is gathered on mobile devices so that the construction managers can take necessary actions after having real-time insights of employees, assets, and equipment in an effective style. The construction companies can better utilize their resources (employees & equipment) to optimize the entire construction process. Connected devices give real-time information, which helps in improving the downtime and achieving better project margin. Ultimately, M2M monitoring will help in developing any construction project in less time and cost.

The other major use of mobile and IoT devices in the construction industry is creating a safer work environment. Safety is of the utmost concern for the construction industry, which is affected by an annual 10% accident rate. GPS tracking and real-time alerts are improving safety of assets while keeping track of their usage. This is proactively improving safety and security of high-value assets such as employees and equipment.



Benefits and Creative Ways in Using Mobile Device and IoT in the Construction Industry



1 | Increase Mobility

Using a mobile app for documentation and communication gives workers the ability to always be on the go. For those who are constantly on the move, it can be almost impossible to keep track of documents and notes. With all information stored in one place able to be accessed from their mobile phone, field workers will enjoy a much easier and compact channel to communicate and document their work. This means less worrying about lost notes and paperwork and more focusing on getting the job done!

2 | Access to Real-Time Information

Mobile applications allow the field workers to submit all documents to a shared platform where members of the back office can view them immediately and know what is going on in the field. This allows project managers to be more informed at all times and allows them to provide direct input or correct possible problems. On top of this, mobile capabilities allow the field workers to be able to request information, maintenance, etc. from the field which saves time and money.

3 | Improving Productivity

With mobile device, workers in the field can submit daily reports, RFIs, emails, and any other form of communication in real-time and receive a response promptly. This means that there is no reason for the worker to leave the field to find information. If the worker doesn't leave the field, they have more time to spend doing something productive which means staying on schedule.

4 | More Accountability in the Field

Without mobile solutions, the back office has no idea what the field workers are doing, which encourages a culture of a lack of accountability. Mobile technology has GPS capabilities that allow the project manager to track time spent on-site, as well as keep better timecards that will save on labor costs.

5 | More Accurate Documentation

Creating reports in the field not only saves a drive back to the office but also ensures greater accuracy. For example, if workers are creating daily reports as



they encounter things, they will create more detailed reports than if they waited to fill out a report once they left the site. Daily reports and any other documentation in the field will be automatically GPS tracked and time stamped which will save you from future disputes and possibly legal trouble.

6 | Integration

Many project management solutions are integrating the mobile application as well as the desktop capabilities so that the people in the back office, as well as the people on the field, can update and view any information at any time. The abilities of mobile are far more beneficial when they can be shared with all stakeholders. It is also beneficial to have all functions exist on a single platform so that written communications, documents, and reporting forms are all available in one place. Many applications are capable of being integrated with an all-inclusive project management solution. This integration ability will eliminate harmful data silos that previously existed between applications.

7 | Transferring Offline Information

It is common for contractors to take remote jobs that may be in an area where they don't have access to a computer or the internet. Luckily, the majority of mobile devices enable them to also send data offline. This means, even though the contractor may not have access to real time information, there's still the ability to transfer offline data that is important to the job.

8 | Tools and Tracking

Connecting tools and equipment to the internet has not only reduced the number of misplaced items but has also subsequently reduced the amount of mon-

ey spent on replacing those items. With a large number of tools and equipment used on any given construction project, it's no wonder that items get lost. Thankfully, IoT in construction has given us the ability to locate the exact location of tools, so we don't have to waste time or money looking for them.

9 | Equipment Repairs

Keeping up-to-date on equipment maintenance and repair is extremely important if you want to avoid machine failure. Mobility and IoT in construction allows machine data to be constantly monitored so that we know exactly when a piece of equipment needs to be serviced. This prevents equipment from breaking down, solving the issue before it becomes a problem.

10 | Decrease Liability Issues & Avoid Litigation

Mobile technology guarantees more accurate documentation within the field, which means a lower likelihood of incurring any legal trouble. For example, safety inspections are extremely important within the construction industry, but paper forms are unable to verify that safety inspections are performed at a specific time and place. This can put your company at risk for lawsuits and various other liability issues. Implementing mobile technology solves these issues by providing validated time and date stamps, as well collecting digital signatures. This gives you the peace of mind that your safety inspections are being completed accurately and efficiently. If any disputes arise later, this documentation can help settle any potential issues or legal action.





11 | Always Stay Up-to-Date

Mobile construction software is hosted using cloud networks which mean companies will always stay up-to-date. Regular updates provide companies with new and updated features that make day-to-day work as efficient and seamless as possible.

12 | Building Information Modeling

IoT in construction has completely revamped the design and construction process. Through Building Information Modeling, we can look at 3D models of buildings to better understand a building's structure and systems. Also, BIM is allowing us to make smart buildings by placing sensors in finished buildings. These sensors can then send us valuable information on how a building is affected by different things like weather and time. This not only gives us important intel on the state of current buildings but also gives us the ability to learn and create better structural alternatives.

13 | Enhanced Security

The construction industry reports maximum cases of accidents and injuries, but with integrated building system managing the security at construction sites becomes very easy. Wearable ERP technologies and RFID bridge the time and distance gap constraints forced by working at remote construction sites.

14 | Energy Management (Saves Energy)

IoT enables sites to efficiently send back information on the energy consumption. This allows adjusting lighting for saving energy after certain hours. Machines can also send back information on their idle time which consumes fuel, with IoT their on and off

periods can be adjusted and regulated. This ensures projects do not waste time in restarting machinery.

15 | Green Building

The construction industry is one big contributor of landfill waste, in the US up to 40% of all the solid waste comes alone from buildings projects. IoT is helping developers to redefine their methodology to design, construct and operate high-performance buildings. Take a look at few examples:

- **Sensor data** – enables companies to estimate the required quantity of building materials in the Building Information Modeling (BIM) phase and thus helping reduce wastage.
- **Embedded Data Collectors (EDC)** – by implanting EDC into concrete, developers can easily measure its mechanical properties.
- **Sensor-generated data** – Senses vacant rooms, controls the electricity consumption and sets heating to the minimum.

16 | Virtual and Augmented Reality

Augmented reality and Virtual reality is slowly being introduced into the world of construction. As it continues to grow, AR and VR will give construction professionals the ability to see operational instructions and other information overlaid onto the real-world view of the project.

Using AR/VR in construction can drastically improve safety. In risky conditions, such as underwater or





below ground, getting a full view of the field before entering and being made aware of potentially hazardous conditions and substances present on site is vital. In some cases, the technology also enables the ability to remotely operate robotic tools, allowing workers to achieve a high level of precision without risking their safety

17 | Drones

Drones are another increasingly accessible application of new technology, used to conduct real-time site surveys and track project progress. Aerial access and mapping capabilities, as well as 3D imaging, benefit worker safety and reduce survey time. The “cool factor” of drones also has the secondary benefit to contractors as a marketing tool.

18 | Intelligent Prefab

Prefabrication has always been used in the construction industry; it's often time saving and cost saving in nature, as well as a waste-reduction measure. But for large projects, trying to coordinate prefabrication has often been a hassle.

RFID sensors make it possible to track pre-fab components through every step of the supply chain. This makes it logistically possible to coordinate an entire pre-fab structure regardless of size and scope of a project. Intelligent pre-fab mitigates job site delays and empowers greater project control with real-time possibility for design adjustment at any phase of a building project.

19 | Smarter Exteriors

Exterior spaces of a building project have IoT capabilities as well. Commercial buildings have parking lots, garages, and public spaces. All of these areas

need lighting. Why install a traditional street light or exterior light when smart lighting does more than just enhance security with illumination?

Smarter exterior lighting systems are available that are packed with sensors connected to IoT. Lights self-adjust according to the data gathered. Whatever the time of day, season or weather, lighting is automatically operating at optimum energy-efficiency. Some cities that have adopted smart exterior lighting systems have reported as much as 40% savings on energy cost.

20 | Cloud Connection

Many new buildings today are connected to the Cloud. The ever-elusive cyber-cloud is, perhaps, the most widely used IoT that is often misunderstood and taken for granted. Consider just two benefits of a smart building connected to the Cloud:

- HVAC systems save time and money, operating automatically. Building management can analyze data to tweak an HVAC system's programming that, over time, can create great savings where energy costs are concerned.
- Foundations equipped with sensors are regularly reporting to building managers about the quality of a building's structural integrity. The load a foundation is bearing can be constantly monitored, assisting building managers and construction project managers in preventing costly and dangerous structural failures.





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