PlanGrid

Leveraging Construction Technology for Smart Cities and Mega Projects

Building better cities with software

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Introduction

Some construction companies only build individual homes, while others focus on creating spaces for both small and large businesses. In some regions, a trend is starting where contractors are being hired to construct entire cities at once. Smart cities are designed from the bottom up, integrating future demands for services with well-balanced density planning and ubiquitous technological integration. Those who take on these infrastructure mega projects face many challenges that have the potential to cause budget and schedule overruns. Even further, many of these cities are still being with paper documentation instead of leveraging modern digital tools.

Organic Development vs Smart Cities

Organic and unplanned development may have worked for thousands of years of early city building, but that's not always the case today. Sprawling cities across the world suffer from a lack of housing, congested streets with poorly managed traffic patterns, disruptions in utility services and other related problems. Smart cities are being promoted by rapidly growing countries like China, India and the United Arab Emirates as the best way to provide their citizens with both the essential infrastructure and room for future growth.[1] The International Business District of Songdo City, South Korea, was designed and built from scratch as a smart city. When completed in 2020, it will offer over 100 million square feet of business and residential space.[2]

Planning and Expansion

While some smart city projects are retrofitting efforts for existing areas, many are brand-new developments. This gives the design and building teams control over laying out cities that can properly expand and grow with population changes. Instead of being stuck with costly demolition and replacement cycles or spreading outward endlessly from a cramped city center, new smart cities are properly zoned with plenty of space to spare around expandable transportation options. With over 60 percent of the world's population expected to reside in a city by 2050, organic development will clearly hinder future growth.[3]

Interconnected Services

Services and systems within a city tend to form silos, which is a term used to describe how distinct and separated parts of an organization can become. Silo services reduce efficiency and increase costs because the demand for connection grows even when the services can't accommodate it.[4] For example, many cities have half a dozen or more emergency departments with separate procedures and communication methods. Breaking down the silos between these departments improves emergency response times, reduces costs for redundant or non-compatible technology and results in a generally more productive city.

Tracking and Responsive Features

Smart cities also utilize the Internet of Things (IoT) and integrated sensors to track and monitor their residents' activity. If traffic patterns change or bad weather leads to unexpected shutdowns, the city itself can respond before humans notice the disruption.

Environmental Sensitivity

Most smart-city projects are also focusing on environmental integration, sustainability and resilience against natural disasters. Cities have a reputation for pollution and poor use of resources, but smart cities can leverage careful design and technology to reverse that trend.

What Makes a Mega Project?

Building an entire smart city from scratch is clearly a mega project, but even working on just one part of a city's infrastructure upgrades can quickly turn into one of these undertakings. Mega projects are defined by the complexity and cost of construction work.

Scale and Cost

The primary factor that determines if a project is mega-sized is the cost. Almost all mega projects have a total cost of over $1 billion, although some infrastructure and expansion projects in the upper millions may also qualify due to the sheer scope and length of build time.[5] Mega projects are large-scale developments, usually stretching multiple miles or covering millions of square feet.

Public and Private Involvement

Most smart-city projects are also focusing on environmental integration, sustainability and resilience against natural disasters. Cities have a reputation for pollution and poor use of resources, but smart cities can leverage careful design and technology to reverse that trend.

Interdependent Projects

Most mega projects really consist of many interlocking and interdependent smaller projects handled by dozens of different contractors and subcontractors. This is one of the biggest reasons to invest in mega project software tools—to track the deadlines and requirements for all the various sub-projects. Missing even a single deadline for an essential utility connection or construction process could result in long-term delays and cost overrun.

High Complexity

Thanks to the integration of new technologies, mega projects also tend to include highly complex designs. Contractors and construction crews need to work closely together to install the wiring, networking equipment, energy efficiency upgrades and other tech specifications. Underestimating the complexity of even one sub-project results in delays across the board as designs are revised or new experts are hired.

Obstacles to Managing Global Mega Projects

Mega projects are ambitious, life-changing and unfortunately prone to complications. Very few make it all the way to completion without at least one of the following obstacles interrupting the design and build stages.

Timeframe Extension

Completion of over 70 percent of mega projects takes longer than projected, with the majority of those late deliveries extending the timeline by 40 percent or longer.[6] Of course, extending the timeline for completing an essential infrastructure project or smart-city build almost always results in budget overrun. However, it's not always possible to prevent all emergencies and breakdowns, such as when the Bertha boring machine broke down during the expansion of Seattle's underground highway sections.[7]

Scope Creep

Scope creep occurs when designers, investors and interested parties all demand changes in the middle of the work. Any expansion, replacement or even reduction in the original plans for the project will result in major changes at every level. Scope creep is the primary cause of both cost overrun and timeframe extensions, followed by unexpected accidents and estimation mistakes made at the start of the project.

Cost Overrun

Research from independent groups like McKinsey and Company reveals that 98 percent of mega projects across the globe experience a cost overrun of 30 percent or more.[6] The amount depends on the type of project and ranges from 20 percent for roadways to 40 percent for railway projects.[8] Usually, both public funding and private investments are combined to pay for these mega projects, so it can be tricky to raise the extra money required. Using modern software tools that allow for more accurate estimations initially is one of the best ways to prevent cost overrun.

3 of the Biggest Mega Project Cost Overruns

Past mega projects illustrate how easily cost overruns can happen.

1

The Channel Tunnel

The Channel Tunnel, or Chunnel, ran only one year over its original projected timeline. Yet it managed to come in at 145 percent of the original budget with a total cost of $21 billion dollars USD/£9 billion GBP.[9] Completed in 1994, it was the longest underwater tunnel at the time. Designers and construction crews were largely unfamiliar with some of the challenges the Chunnel would pose and many of today's ongoing mega projects are staying better on track thanks to lessons learned from its building process.

2

The Big Dig in Boston

Boston's Central Artery/Tunnel Project, commonly called the Big Dig, was always projected to cost billions and take years to complete. However, no one predicted it would cost nearly $15 billion instead of the projected $2.5 billion initially estimated.[10] Some tallies put the true cost at over $24 billion when interest is considered, which would add up to one of the highest mega project cost overruns.[11] It also took nine years longer than expected to complete, thanks to labor issues, contract disputes, equipment breakdowns and design changes.

3

China's Three Gorges Dam

The idea for generating power with a Three Gorges Dam structure dates back to 1919. Construction began in 1994 and was completed in 2012, wrapping up ahead of schedule. However, with a final cost of $24 billion, it was significantly over budget.[12]

How Mega Project Software Tools Prevent These Problems

It's never too late to add software tools to a complex mega project. Even if a company is already in the midst of a major contract, taking the time to train on a new construction software solution like PlanGrid will pay off in multiple ways for every level of the firm.

Faster Communication

Staying on top of a mega project requires constant communication between multiple teams of project managers, specialists, laborers and subcontractors. The best construction software offers instant communication options like synchronized document notations, real-time communication across the teams and push notifications for updates to crucial information.

Improved Planning and Risk Analysis

Since underestimation and planning mistakes account for a large percentage of mega project cost and timeframe overruns, look for construction software that improves the risk analysis stage of construction. Appropriate planning starts with accurate estimates of every material, subcontracted service, permit and other related need of the project. Tracking every detail by hand is overwhelming, but integrations between different construction software apps make it easier to get the big picture and produce accurate estimates and forecasts.

Secure Storage

Mega projects often involve secure data due to the involvement of health-care clients, government agencies or other public service departments. Keeping all the data exchanged between teams secure to the specified codes of various clients can strain any construction firm's IT resources. The right construction software should already meet common security standards, such as SOC1 and SOC2, to help users meet the demands of their biggest clients.

Seamless File Sharing

Sharing the latest versions of all the relevant project documents, blueprints, drawings, contracts and other essential files can become nearly impossible with email or other non-specialized software. Mega project software tools offer cloud storage for all relevant data, ensuring everyone can access it without the need to convert files or worry about losing access to local storage.

Conclusions

Smart cities, mega projects and other massive contracts are going to account for more and more of the global annual construction spending with each passing year. Any construction firm looking to capture some of this business should start by investing in the right software tools. Correctly laying the foundation for large-scale projects will lead to far fewer budget and timeline issues in the midst of the work.

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PlanGrid's Construction Productivity Software is the easiest and most cost-effective way to get substantial return on your investment in construction mobile apps. By using PlanGrid you will:

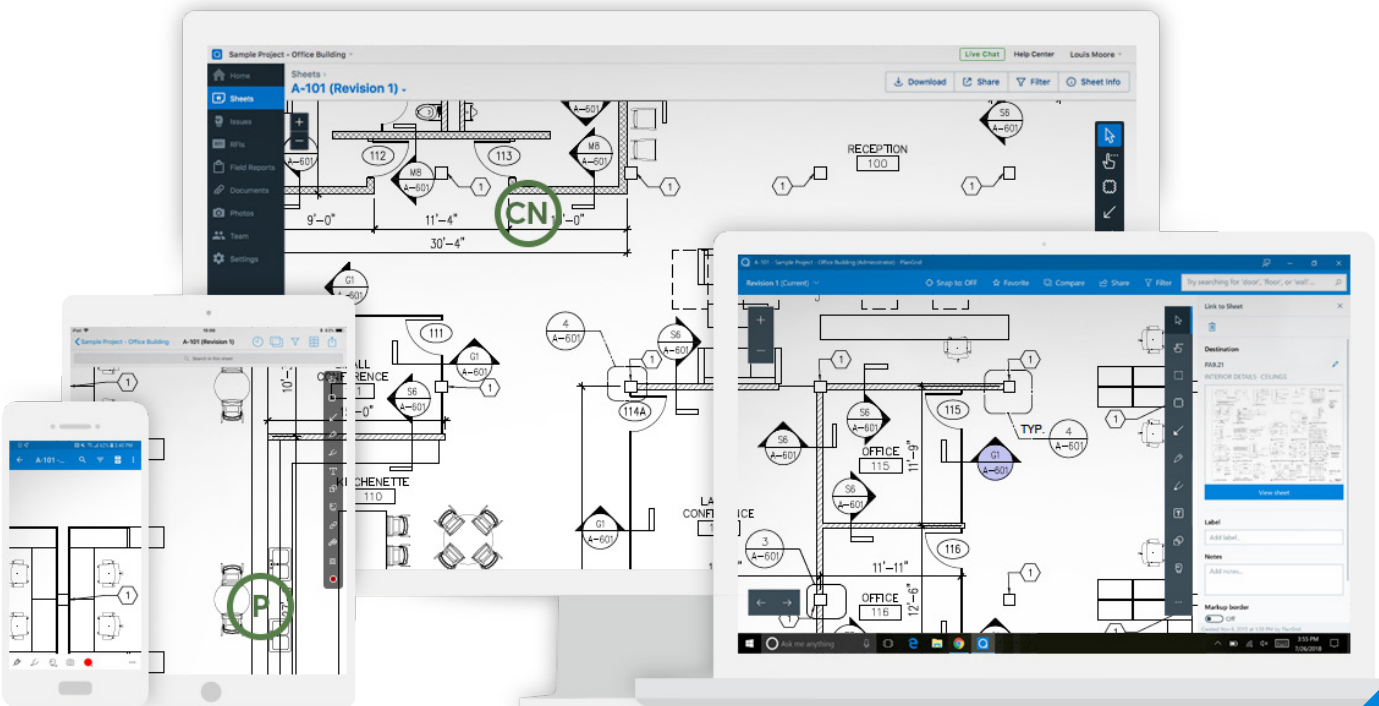
- **Complete projects faster:** 90% of project costs occur in the field and not in the office. This includes wasted time and project delays. With PlanGrid, you can reduce wasteful trips to the trailer and time delays, while eliminating costly rework. PlanGrid also allows for faster collaboration and communication.
- **Reduce costs:** PlanGrid allows you to optimize productivity in the field, which eliminates time waste that causes project overruns. By completing projects early or on time with PlanGrid, contractors will benefit from reduced costs.
- **Win more bids:** The best way to bid more competitively is not just to track costs so you can provide more accurate estimates — it's to improve your overall productivity. PlanGrid's Construction Productivity Software will allow you to increase productivity so you can reduce costs and win more bids.

PlanGrid is construction productivity software used on more than 1 million projects across 90 countries. Our software helps teams collaborate more efficiently with access to an intelligent record set on any device.

Available on the App Store
★★★★★ (3,904)

Get it on Google Play
★★★★½ (2,080)

Available on Windows



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Used on more than 1,500,000 projects around the world, PlanGrid is the first construction productivity software that allows contractors and owners in commercial, heavy civil, and other industries to collaborate, collect, and share project information from any desktop or mobile device through the entire project lifecycle.

PlanGrid increases project efficiency by streamlining document management, providing construction teams with easy access to all project information from any device, and enabling seamless collaboration within teams.

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