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THE SCIENCE OF WHERE

HUVIAiR

WHITE PAPER

GeoSpatial Technology for **Construction Planning** and **Management**

What's Inside

Executive Summary

The construction industry is looking to adopt innovative solutions for operational efficiency, productivity improvement, and real-time progress monitoring based on actual site conditions. This paper highlights:

- The benefits of utilizing drones and GIS technologies
- The integrated workflows of drone images into the GIS platform

Compared to any other industry, the construction industry has had the lowest productivity gains over the years. Large projects across asset classes typically take 20 percent longer to complete than scheduled and are around 80 percent over budget. One of the major reasons for this drop in productivity is the low level of adoption of new technologies.

McKinsey used a digitized index of 1 to 100 to compare technology expenditure and extent of computer usage in operations among the US industries, where a score of 100 was the most digitized. The construction industry is at the bottom of the list. Among the measures McKinsey suggests to resolve these problems, the number one focuses on higher definition surveying and geospatial technologies.

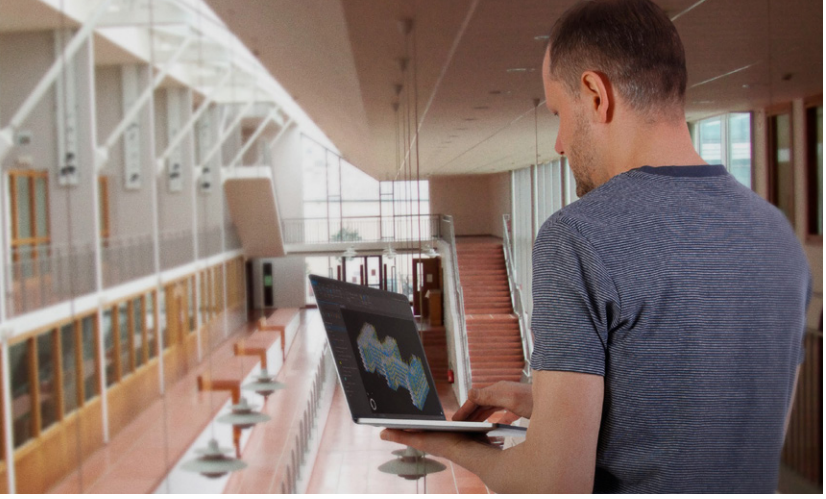
A commercial drone paired with the right software for data processing and analysis, can vastly change efficiencies and reduce costs across all phases of a construction project.

The construction industry has been facing challenges of overrunning most of the projects, which end up increasing their cost and decreasing profitability. Now, the post-COVID scenario, with social distancing measures and travel restrictions, has created even more challenges for this sector.

KPMG conducted a survey in India to assess the cost impact of the ongoing COVID-19 pandemic on construction projects. The survey took into consideration essential aspects such as manpower, plant and machinery, and material, as well as their net impact on overall construction cost. More than 30 construction sector professionals participated in the survey, and it measured the impact on different stages of the project. It noted that labor costs for skilled workers are expected to rise by 20-25 percent while the same for semi-skilled and unskilled workers is estimated to increase by 10-15 percent. The survey also noted that projects under development are likely to take a severe hit with a minimum delay of two to three months, depending on its geography and spread of coronavirus in and around the project site.

The survey further said that since the construction period would increase due to the lockdown, there would be an additional interest cost on the working capital loans taken. These costs will be borne by the developers or contractors, depending on the risk-sharing mechanism.

The industry is looking at intelligent construction management solutions that can monitor and improve productivity, and reduce the turnaround time of projects using technologies like drone images, videos, location, and geospatial data.



Enhancing Construction Productivity with Visual Intelligence

This solution processes and analyzes construction site data using drones, GIS, location data, 360 cameras, and phone cameras. Hence, it helps clients save on progress monitoring time by 75%, manpower requirement by 50%, and overall costs of the project by up to 20%.

Portfolio Management

Maintaining a competitive edge is easier with the right knowledge and insight. GIS allows real estate firms to gain a greater understanding of the sites that are being developed for any one location. The impact of changing commercial tenants, expanding retail square footage, or altering the mix of commercial and residential sites can be analyzed using techniques that provide new insight into future success factors as compared to traditional business reports or tabular analyses.GIS adds geographic understanding that allows market forces and motivating factors spread across a market area or sphere of influence, to be captured and used in business insight analysis -- something that cannot be done using other solutions in isolation.

Assets Mapping and Construction Site Monitoring

Construction site mapping helps in inventory management by understanding and locating the stocks. A piece of alert information can help supervisors collect material from sites and warehouses. It also helps personnel to keep track of any shortage of material and thus manage the entire workforce accordingly.

These days organizations are interested in tracking all the assets from the site. Supervisors like to know the movement of trucks and other vehicles, including cranes. Using the ESRI Geo Event Processor, they can track the assets in real-time and get alerts generated from the geofenced area.

GIS Enhances Construction Surveying

Construction surveying provides the critical link between exact design engineering and precise on-the-ground layout of industrial facilities. Industrial construction facilities often require deep foundations that transfer building loads farther into the earth as opposed to shallow foundations.

For the precise layout location of each construction asset, survey-grade GPS equipment can be used to mark the location where each asset will be installed and placed. This GPS technology can be implemented using ESRI mobile apps that collect geographical co-ordinates along with attributes information. This collected information is highlighted on a project monitoring dashboard updated in real-time through ESRI field apps – Collector for ArcGIS, Survey123 for ArcGIS, Workforce for ArcGIS, and Quick Capture for ArcGIS. The blend of all these ESRI mobile apps aids the organization in optimizing the construction operations via supervision and surveys.

Using ESRI Drone2Map application, you can create Orth mosaics, 3D Mesh, and DSM. These outputs can be seamlessly shared with the organization using ESRI Enterprise.

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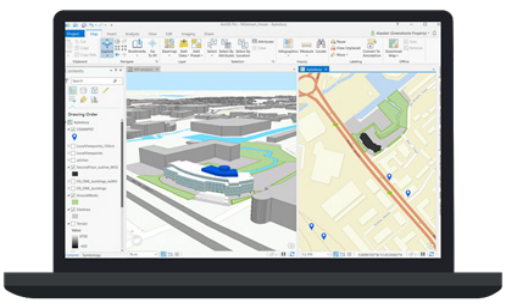


GIS Allows Better Collaboration Across Organizations

Using GIS apps, real estate players can quickly bring together their own corporate insight and fuse it with authoritative industry information, public records, and other local sources. They can share this with colleagues, clients, and communities via ready-made apps and templates optimized for smartphones, tablets, and your computer. These apps include not only external data like boundaries but also organization data that is collected through a survey using mobile apps or drones and inputs through CAD, among others. Using ESRI enterprise will help in integrated project monitoring with involvement from other stakeholders (site engineers, project managers, architects, etc.). It is very important to have a common site progress picture for project management.

Capabilities of Drone Platform

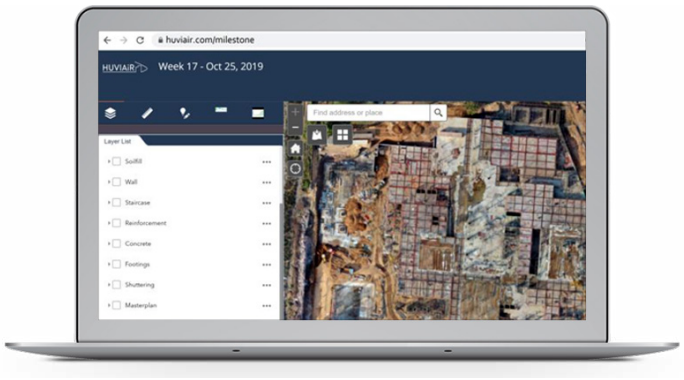
- Replace the cost of at least one site supervisor per site since the drone solution undertakes complete monitoring and reporting on a weekly basis.
- Reduce the amount of travel required from the corporate/head office to the site, something that is especially difficult in the post-COVID world. All measurable visual data concerning each aspect of the construction is accessible from any device in any location via a secure login.
- Extremely accurate and timely reporting, thereby enabling better and faster decision making. This, in turn, speeds up the construction process.
- Immediate detection of deviations and a considerable reduction in the cost of reworks.
- Historical, measurable visual data is available as evidence in case of litigations, saving huge costs in such events.
- Easier to present data of work completion to banks, enabling quicker disbursement of loans.
- Access to real-time visual data can be given to contractors, PMCs, and clients, making it a single platform for collaboration.

Huviair Drone Solution

Drone data processing –

Raw Drone data gets processed and provides the following outputs for online visualization and analysis -

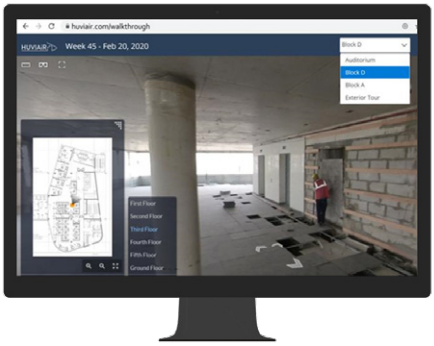
a. Orthomosaic with pixel-level elevation values
b. Contours
c. Annotations Tool
d. Distance, Area, Location Tool
e. Volume Tool
f. Elevation Profile Tool
g. Overlay of Drawings provided
h. 3D mesh generation and overlays with BIM



360 Camera data processing –

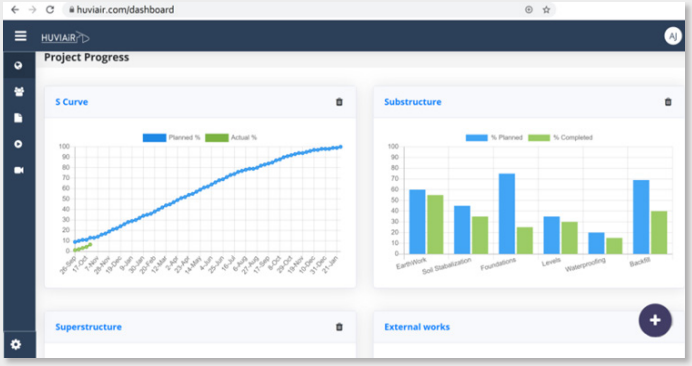
Raw 360 camera data is processed and provides the following outputs for online visualization and analysis -

a. 360 Tour
b. Correlation of tour with floor plans
c. Correlation of tour with BIM
d. Distance Measurement Tool
e. VR Visualization Option



Computer Vision-Based Progress Dashboards –

Computer vision-based deep learning engine system automatically detects and reports the actual progress of construction, and plots it against the planned progress metrics derived from Microsoft Projects or Oracle Primavera.



Live video streaming from drones –

For instant inspection, the drone video capture can be live-streamed into the Huviair Cloud Platform. This can be accessed from any device and from anywhere.

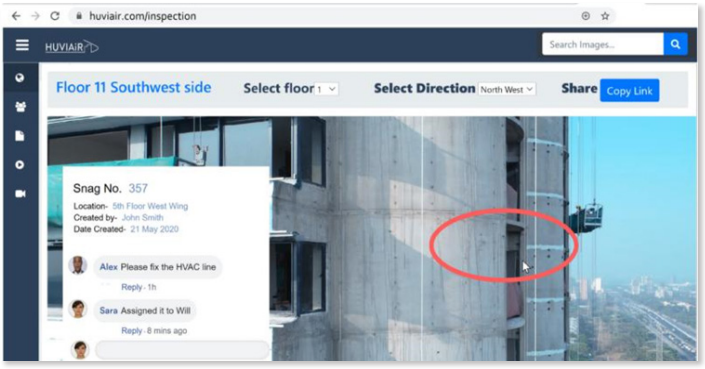
Smart Project Media Gallery –

All relevant photos and videos (taken from drones, mobile phones, 360 cameras) from the site can be uploaded to and are be available for viewing in our smart media gallery. Our gallery offers features such as

Annotations and Comments:
Users can tag other users and add annotations and comments to the images via an interface similar to Facebook.

Snag/Task Management:
Users can further convert comments into snags or tasks and follow them up to closure remotely! All the snags and tasks can be managed virtually using the smart gallery.

Inspection of Cladding and Facades:
Inspection of the exterior of construction such as cladding and facades can be done quicker and in a much safer way. On the Huviair Cloud Platform, you can toggle and navigate to any particular exterior construction and inspect it in ultra-high resolution.



Conclusion

GIS helps maximize the strengths and capabilities of a business by identifying the best operating location and various intra-site operations as well as activities. ESRI's platform and Huviair's software and data solutions let construction companies combine different site datasets and workflows to provide business analysis and spatial analysis. Thus, eliminating guesswork from site analysis and providing deeper insight into the local construction, real estate environment, and market forces.

About Esri India

Esri India Technologies Ltd (Esri India) is an end-to-end Geospatial Information Systems (GIS) solutions provider enabling its customers to think and plan geographically to make timely, well informed and mission-critical decisions.

Esri ArcGIS platform provides the backbone for the country's mapping, spatial analysis, and all GIS requirements. A market leader in GIS Technologies, the company has successfully delivered cutting-edge GIS solutions to more than 5,000 customers for applications in Land management, Utilities, Infrastructure, Disaster Management, Telecommunications, Urban / Municipal, Smart Cities, Transportation, Defence, and Natural resources.

Established in 1996, Esri India is headquartered in Noida, Uttar Pradesh, with multiple regional offices across India.

About Huviair

Huviair is a B2B cloud platform company that processes and analyses construction site data using drones, 360 cameras, and phone cameras. Thus, helping clients save on progress monitoring time by 75%, manpower requirement by 50%, and overall costs of the project by up to 20%.

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