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An Introduction to Drones: How they are Revolutionizing the Construction Industry

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Running Title: *drones in the Construction Industry*

Abstract: ***This article provides a comprehensive overview of the growing role of unmanned aerial vehicles UAVs or drones in the construction industry. Drones have permeated various aspects of our lives, and are increasingly being utilized to optimize construction processes, enhance safety measures, and improve overall efficiency. The paper explores the advantages and drawbacks of incorporating drones in construction, highlighting their potential to revolutionize surveying processes, increase productivity by up to 60, and reduce worker exposure to dangerous tasks. However, it also discusses the limitations of drone usage, such as weather constraints and privacy issues. Furthermore, the article emphasizes the significant impact drones can have on enhancing worker safety in an industry known for its high casualty rates and machinery theft. Lastly, it underscores the need for continued technological advancements and increased adoption of drones in the construction sector to address these critical challenges.***

Keywords: construction industry, drones, efficiency, safety, surveying

1. Introduction

An unmanned aerial vehicle (UAV), also called a drone, was first introduced as a radio-controlled aircraft, designed to be a target for training purposes. But today, these UAVs, or drones, are progressively becoming more popular, and therefore their uses are extending into daily life. From food and medical delivery to military operations, drones are more prevalent in the lives of the general population than ever before. One of the most popular industries for drones today is Construction. Drones can help optimize construction work, make it safer, and quicker, however, they require a lot of skilled personnel, and cannot be utilized in bad weather amongst other problems. The first UAV incident of 2018 in the UK was in January while attempting to survey a building site in Kemsley Mill, a flier with 26 hours of experience crashed into the jib of a crane on the construction site. Drones seem to be quite useful but also have a lot of downsides to them. However, construction workers lead challenging lives due payment issues, licensing issues, unreliable contractors, and most importantly- safety issues. Drones could drastically improve the worker standard in the construction industry. This paper attempts to provide a comprehensive overview of the usage of drones in the construction industry, its advantages, and its drawbacks.

Technology:
There is a lot of work needed to be done on a construction site, and all this work requires heavy machinery and bulky scaffolding. Instead of putting people at dangerous heights and making them do tons of manual labor, drones can simply fly up to the hard-to-reach parts of structures to check fine details. Drones can also help avoid any issues in the work by using thermal sensors to check heat leaks and cold spots as well as electrical issues. There are also different types of drones like the Fixed Wing Drone which is more effective for analyzing larger areas and the Rotary Drone for inspection over shorter distances.

In addition, drones can capture data in real-time, providing videos and measurements as it's flying. Drones are not limited to simply this, AI can be integrated into them to identify patterns and generate actionable insights, which people aren't always capable of doing. Drones can transform the raw data that they've collected into comprehensive reports to organize information, making work a lot quicker for construction workers.

Efficiency:
Surveying a construction site can take a couple of days to even years, depending on the land area and surrounding infrastructure. Planning and performing a site analysis to label boundaries and control points, then identifying existing infrastructure like pipes, cables, and drainage systems, and finally, writing a survey report; Surveying is no simple task. This is why efficiency is key in an industry such as construction, which calls for the use of drones. Drones are being introduced more and more in construction sites today to speed up this process. According to an approximation, drones increase efficiency in surveys by 60 times the traditional method, increasing productivity by 50-60%. While professional drone surveyors would need to be hired to utilize these drones, increasing the cost of the surveying process, the increased efficiency more than makes up for that.

Drones take less time to complete surveying, but they aren't very reliable. Traditional surveying is less likely to be stopped than drone surveying since drones cannot be used indoors, nor can they fly in bad weather. In contrast to work done outside, indoor and underground surveying will have to be done traditionally as drones are not yet designed to be used in a smaller space. Some drones are capable of flying in strong winds, but even those cannot stay stable in winds above 20 mph or 32 km/h. While they can still fly, using drones to survey in unfavorable conditions would lead to misinterpreted data and possible damage to the drone(s) itself. These winds, being just slightly above the average, aren't uncommon. This means that drone surveying work will often be adjourned due to the weather.

Moreover, drones cannot be used outdoors even in favorable weather easily. A survey with 153 participants found that working near drones or UAVs "reduces the attention

workers devote to the task at hand, which could result in falls when they are at height." The effect that drones have on construction workers on a site is not limited to being a distraction, but also a cause of emotional and psychological distress for the workers as if they are being monitored constantly.

Safety:

20% of all worker deaths in the United States are in the construction industry, however, only 6% of workers are specifically construction workers. This goes to show that workers in the construction industry face a lot of danger and more precautions are needed to protect them. Using drones for more dangerous tasks can decrease these deaths significantly. Where workers would have to risk their lives to survey parts of a construction site, that role can now be fulfilled by drones. Drones can help gather data on hazardous parts of a site, produce high-quality images, and possibly help form 3D replicas to help organize the layout. These can drastically reduce the burden on workers to put themselves in danger.

ELCOSH has found that safety construction companies spend 3.6% of their budget on injuries but only 2.6% on safety training. Construction workers are not taken care of enough and 58% of construction workers believe that productivity takes priority over safety on a construction site. Furthermore, 51% of workers say that companies only do the bare minimum to keep employees safe. This further proves that drones are needed in construction sites, not only for efficiency but also for the workers' safety as well. The use of drones can make up for the lack of responsibility shown by employers. While not all deaths of workers in the construction industry are caused by falls, which can be lessened by using drones, they are in fact the second leading cause of death in the industry. Drones can also be used for Security. Approximately $300 million worth of construction equipment is stolen annually. Drones can decrease the human resources needed by being used for surveillance, replacing security guards used for night shifts.

2. Conclusion

The construction industry is notorious for its high casualty count and excessive theft of machinery, construction workers face a lot of problems in their jobs. Drones have been used in construction for a long time now, but their use in the industry has recently been increasing, the reason being the progress in technology; the ways they can positively impact the work's efficiency in cost and time as well as improved safety and data accuracy. Today, different types of drones can be used for collecting data accurately, and that data can be analyzed and organized by AI, optimizing work and preventing injuries that would otherwise be caused due to workers putting themselves in danger for surveying. Additionally, these drones can do all this work in a way shorter time. These drones, however, cannot be used indoors or in poor weather conditions. Moreover, they cannot be used over private property or in no-flight zones. This could be a reason why only 37% of construction workers work or have worked with drones on a site.

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