Review Paper on Construction Project Management Using Drone And Photogrammetry For Residential Building

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Abstract- *Over the beyond decade, researchers have used unmanned aerial systems (UASs) with inside the production enterprise for diverse programs from web website online inspection to protection racking or constructing maintenance. This paper pursuit to assort educational research on production UAS programs, summarize logics at the back of the usage of UAS in every utility and expand know-how of modern-day kingdom of UAS studies with inside the production setting. This study follows a scientific literature evaluation method to summarize the effects of 25 studies papers during the last ten years and descriptions the studies developments for making use of UASs in production. Over 25 magazine papers have been retrieved from the Scopus database for an in-intensity evaluation of important programs, benefits, and regions of destiny studies potential. Thus, two main lines of research using image-based techniques were identified. (1) Construction safety; (2) Monitoring progress. In recent years, unmanned aerial vehicles (UAVs) have been widely used in various construction and operational applications in various construction projects. The main purpose of this article is to provide a brief overview of drones in the construction industry. In construction and construction, sustainable buildings involve a variety of issues including design and project management. In recent years, different types of technologies have helped improve project management. One of them is unmanned aerial vehicles (UAVs). UAVs are used in the construction industry as a real-time data acquisition technology. Therefore, this study will help construction managers raise awareness of the use of these new technologies and help researchers further explore the use of multi-rotor drones in construction projects.*

Keywords- UAS, UAV, drone technology, construction projects, etc.

I. INTRODUCTION

The use of drones is anticipated to produce jobs by 2025 according to The Association for Unmanned Vehicle Systems International (AUVSI). The construction assistance is anticipated to regard for the largest growth in the marketable assiduity of drone use3. The uses of drones in the construction and engineering assistance are continually growing. Some of the areas of drone use in the construction and engineering assistance correspond to check mapping, examination, and job material shadowing. Survey mapping with drones has changed the assiduity. The use of drones in surveying has made the job safer, and the speed of producing a check has dropped from hours to twinkles. Drone mapping makes it possible to be suitable to pierce areas that may be inapproachable by bottom. Drone mapping is less precious than traditional styles of surveying. The delicacy of drone mapping is within0.1 bases. Another use of drones in the construction assistance is examination. The Oregon Department of Transportation (ODOT) recently completed a study, "Eyes in the Sky Bridge Examinations Unmanned Aerial Vehicles' ', the report details their use of drones for examinations of islands. Examinations of islands are needed every two times, commanded by the Federal Highway Administration (FHWA). The examinations of islands can be dangerous for the inspector. Inspectors are needed to gauge the islands to get to the areas needed to be audited. The use of drones is suitable to give the ground inspector a safe way to observe different areas of a ground. A problem that arises on large construction job spots is the capability to track the position of delivered material on the job point. Drones equipped with radio frequency identification (RFID) compendiums are presently being used to track and detect material on the jobsite. RFID is a wireless communication technology, conforming to a label and anthology configuration. The label attached to the material contains pre-written information describing its use and contents. The drone that's equipped with the RFID anthology is suitable to detect the delivered material and convey to the airman the precise position of the material and identify the information are-written about the material. People have been constructing and developing effects for a long time. Construction will be around for numerous times, but the styles of design, Planning and Prosecution will change. All the effects are streamlined and developed. As every time new technology is entering the construction assiduity effects are

moving so briskly than earlier. That's why to match the speed of work we need to contemporize our monitoring and controlling styles. Then drones are started to make a big impact. Drone doesn't help in factual construction but it helps in an important part of the design that's growth.

Construction industry nowadays demands highly precise planning and work scheduling. Effective management of a project comes with good specification, requirements and inspections of the project which can enable the overall optimization in time, cost and resources. However, many of the projects still engage traditional methods to monitor progress and conduct inspection. It has caused many disadvantages in the decision making such as poor documentation. From civil engineering areas, the drones could apply as tools for the visual inspections process either mapping area, working progress, inspections of high structure and to locate defects and cracks. Aging infrastructure has become a major concern especially for elevated highways and bridges where roughly the life cost is due to repairing and maintenance. Drones also can be used for ecological and environmental monitoring, urban traffic monitoring, building environment monitoring, species distribution modeling, population ecology, and ecological monitoring and conservation. Archaeology and cultural heritage, human and social understanding, personal and business drones for photography and videography, and even delivery services are other applications of drones. In addition, the unmanned aerial systems have been successfully used in different industries, such as agriculture, oil, and gas, construction, environmental protection, mining, etc. The use of drones could be of a particular interest as camera carriers and image transmitters. Drone could follow a predetermined path or could move by visual control and detect by the means of image or video of size and location of defects. Even with a systematic approach, maintaining an old structure is a formidable challenge. Structural deficiencies in ever-aging elevated highway structures and pipeline systems become increasingly likely to occur as time passes. Additionally, urban growth and development place greater demands on these structures and systems and create the need for further maintenance and construction. Inspections after potentially catastrophic events such as hurricanes, earthquakes, major vehicular accidents, and sabotage, are also necessary. The effectiveness of routine inspections is limited by manpower and funding.

Aim of this study is to define advantages and limitations of application drones for visual inspection rather than conventional methods which use sky lift machines or humans itself. It is also to study the impact and changes in the construction industry and to analyze the outcomes and impact in terms of time, cost, human error and safety factor.

II. LITERATURE REVIEW

For the literature review, the database used included VT Library, ASCE, and IEEE. In addition to these databases, Google Scholar, and industry reports published by CMAA, and NIBS were some of the other sources referred for this study. And the keywords used for the search were, 'construction projects', 'drone technology', 'safety management' and 'project management.' The objective of conducting a literature review for this study was to find use cases of UAVs in various industries. Although there is a lot of research on the development of UAV systems, there is a lack of studies that include a use case and focus on a particular application of these systems i.e. in the construction industry. With these developments of systems focusing on certain applications, it becomes easier for the participants to relate to the technology and suggest better ways of using and integrating this technology in construction.

Suraj G. Gupta, Mangesh M. Ghonge, Dr. P. M. Jawandhiya [2013]- Whatever mission you choose for yourUAV, its number and use will increase significantly in the future. UAVs today play an increasingly important role in many public missions, such as border surveillance, wildlife surveys, military training, weather monitoring and local law enforcement**.**

Prof. Neil D. Opfer, Dr. David R. Shields [2014] - Contractors or trainers working in other countries may face the same types of FAA restrictions or lack ofregulations, depending on their jurisdiction. Faculty using UAVs in high-level laboratory buildings or contractors inspecting atrium interiors will not face FAA restrictions**.**

Javier Irizarry, Dayana Bastos Costa [2016]- Related case studies Development of a database of visual assets of images and videos based on UAVs collected during UAV flights at US construction sites and Brazil, semi-structured interviews with construction project employees**.**

Jesse Sanchez [2016]- There is enough research on the topic , but no real-world examples. Webcam serves as an example of this in a case study. The research methodology for the Project is based on interviews and questions with project managers, supervisors, licensing experts, BIM engineers, and assessors. Various interviews reveal the impact of drone technology and BIM on various business sectors. Topics chosen during the interview were hardware, software, survey, security and financial impact. These results prove that drone technology is a relatively new industry with common applications.

William Wilkins, Geoff Mitchell [2017]- Discussion on current and future uses of 3D imaging technologies, including laser scanning, LiDAR, oblique and satellite imaging, photogrammetry, and video surveying. They will look at how designers and consultants are using embedded information to improve the validation process, measure progress, and measure and simulate the creation process. Participants will be informed to improve the speed, safety and accuracy of trading and modelling operations, understand the limitations of and reduce costs. Speakers learn how to improve several collaborative/unmanned aerial vehicle (UAV or unmanned aerial vehicle) checkout processes and automate surveying across multiple applications**.**

Mark C. Tatum and Junshan Liu [2017]- The main focus was on the risks associated with the use of theUAV on construction sites, internal and outsourced resources, as well as the future use of the UAV in construction. Data was collected from the Federal Aviation Administration (FAA) online databasewith Section 333 exemptions and Survey distributed to the US construction industry. Survey results show that many enterprises are using UAVs in the field, with most applications replacing traditional UAVs. Taking photos and videos, results showed that internal UAV operations are more common than outsourced.

Brodie Y M Chan, Ian J Saul, Tim J Pettigrew and Daniel J Anstice [2017]- With a high percentage of bridge infrastructure on Australia's east coast approaching key intervention points and needing to extend the life of the assets, thisbecomes increasingly important when the current condition of the bridge assets is accurately determined to ensure accurate coverage. As the industry transitions to more than automated and intelligent processes, photogrammetric modelling is introduced as a technology offering a significant opportunity to redefine contracts for bridges. Using simulation-based applications, themaintains accurate information about the current state of the design as part of thecontract documentation, reducing change risk and improving information management throughout the project lifecycle **.**

Hazim Shakhatreh, Ahmad Sawalmeh, Ala Al-Fuqaha, Zuochao Dou, Eyad Almaita, Issa Khalil, Noor Shamsiah Othman, Abdallah Khreishah, Mohsen Guizan [2018]- Based on our evaluation of the current literature, we talk about open studies demanding situations and draw high-stage insights on how those demanding situations are probably approached. The use of unmanned aerial vehicles (UAVs) is growing swiftly throughout many civil utility domain names which includes real time monitoring, presenting Wi-Fi coverage, faraway sensing, seek and rescue, transport of goods, protection and surveillance, precision agriculture, and civil infrastructure inspection.

Naveed Anwar, Muhammad Amir Izhar, Fawad Ahmed Najam [2018]- Drone image data from various locations and point clouds (from 3D scans of construction sites) can be used to build 3D models using photogrammetry techniques. This so-called "drone model" can track the progress of the site at various stages of construction compared to the BIM model. In addition to construction planning and cost calculations, this comparison can be recorded, reported, billed, verified and planned in real time. Using the example of the construction project in case, we demonstrate the effective use of drone data in terms of monitoring and comparing smart structures between drone models and BIM models.

Alex Andersson, Johan Svensson [2018]- For further evaluation and comparison of the, an inexpensive UAV and a total station were used in a field survey at Malmö, Sweden to obtain 3D data from the building. We alsoanalysed the future and implementation assessment of the UAV through literature reviews and interviews. With professionals working in the construction industry. The results show that a spatially accurate point cloud can be obtained without using a ground reference point (GCP). This point cloud doesn't usereference points and doesn't give an exact absolute location for a given frame of reference, but they would still be useful because elevations and other building floor plans don't need this.

Soroush Dastgheibifard, Mahsa Asnafi [2018]- At Construction, sustainable construction encompasses a variety of issues including design and project management. Over the past years, different types of technology have helped improve project management. One of them is the unmanned aerial vehicle (UAV) . As a technology for real-time data collection, UAVs are used in the construction**.**

Dr. Ibrahim Motawa and Alexandra Kardakou [2018]- This study found that visual imaging is the most popular use of UAVs on construction sites to ensure integrity of structural inspection, but 3D models derived from LiDAR and photogrammetry are surpassing more traditional methods. UAVs are also used to monitor workers on site to identify what resources they need in order to carry out their tasks more efficiently and also for the purposes of their health and safety. Despite the approved efficiency of using unmanned aerial vehicles on sites to provide better visualization of the working environment, there are still key issues to be tackled such as: the limited flight time of UAVs and its weight. On the use of aerial vehicles, there have been some problems of which the most important is the cost. There is further research needed into the combining of UAVs derived data and its inclusion

into BIM, as barriers remain regarding translatable data platforms. There are also some ethical concerns of surveying workers on site and how to protect their privacy.

Joseph S. Sanson [2019]- The purpose of this white paper is to provide an overview of drones, a description of applications of how drones are used in the construction industry, how local contractors work together for current and future use of drones, and a civil and building engineering technology program. Youngstown University plans to include the use of drones in its current curriculum. Over the past few decades, unmanned aerial vehicles (UAVs) or drones have become relevant in the construction and engineering industries.

Matúš Tkáč, Peter Mésároš [2019]-The goal of this article is to provide a broad overview of the usage of unmanned aerial vehicles (UAVs) in civil engineering. The article also discusses the many types of UAVs used in construction, as well as their benefits and drawbacks. The use of UAVs in civil engineering has many advantages: creating real-time aerial images from building objects, overviews reveal assets and challenges, as well as the general lay of the land, operators can share the imaging with personnel on site, in headquarters, and with subcontractors, planners can meet virtually to discuss project timing, equipment needs, and terrain challenges, and operators can share the imaging with personnel on site, in headquarters, and with subcontractors.

Hamlet Reynoso Vanderhorst, Subashini Suresh, Renukappa Suresh [2019] - The implementation of UAS is bringing easiness and time saving activities into the currently construction site task. In the construction industry, diverse and relevant benefits of the technology have been identified through the project life cycle, such as monitoring project progress report, faster and low-cost land measurements and 3D modeling. The finding of this paper is providing exemplification models of current usage such as visualization and disaster management, evolution map of the UAS according to the publication numbers and construction project stages when to use the UAS.

Masoud Gheisari, Behzad Esmaeili, Jana Kosecka, Abbas Rashidi [2019] - The specific purpose was to investigate the practical implementation of unprotected edges and UAVs for monitoring fences near openings. To achieve this goal, a UAV was used to acquire a real-time video stream of a construction site, and then an image processing algorithm was developed for testing to detectfences in full color images. The project used a case study approach to study technological developments in a hazard identification system, which were then implemented and tested in a high-rise construction project. Studies have shown that the proposed automatic fall hazard recognition system can facilitate obstacle recognition in high-rise construction projects.

Farzad Pour Rahimian, Saleh Seyedzadeh, Stephen Oliver [2019] - This article provides the basis and some advanced IT solutions, i.e. prototypes for automated simulation of on-demand construction projects that incorporate images processing, machine learning, BIM and virtual reality. The proposed structure automatically updates the 3D virtual environment in consideration of the current status of the construction site. This structure provides project managers and shareholders with improved decision-making tools to effectively identify discrepancies.

Efosa Alohan [2019] - This study examines the current use of BIM in construction projects and the overall workflow improvement of theusing drones. This study utilized an empirical study on three Swedish construction companies and a qualitative research method through semi-structured interviews with people. Contributions to this study include balancing organizational changes to effectively implement the BIM Drones solution, which intelligently integrates data into existing BIM software for validation, security, and accurate site monitoring. Building Information Modelling (BIM) has recently gained widespread attention in the Architecture Engineering and Construction (AEC) industry.

Pawan Kumar Mishra [2019] - In this paper, the author proposes a view of the uses of drones in the construction industry and how Indian laws regulate drones. The author also proposes what the future of drones in the construction industry might be. The construction industry is in the process of revolution and it is adopting the technology to improve productivity, quality, and reduce the risk. Now the construction industry is adopting innovations. The present construction industry is embracing a technology and using it to deliver differently.

Suk Bae Lee, Mihwa Song, Sukgu Kim and Jae-Ho Won [2020] - This study investigates the possibility of using a UAV to monitor deformation at a highway construction site in South Korea. In this study, UAV photogrammetry was performed three times, and an orthographic mosaic of the construction site, digital surface model (DSM), and three-dimensional topographic information model (TIM) were generated through data processing. In addition, using 2D CAD (Computer-Aided Design) design drawings, 3D BIM (Building Information Model).

Anamika S. Jadon, Damini A. Patil [2020] - The author's deployed unmanned aerial vehicles (UAVs) to perform autonomous navigation for power line inspection. The UAVs

were used to detect, inspect, and diagnose power line infrastructure issues. For real-time power line inspection, the authors conceived and deployed a completely automated UAV-based system. Drone technology has advanced in the previous ten years to extend battery life for longer flying times, carry heavier payloads to house more sensors, and make the system easier to handle for pilots.

Michael Elstner [2020] - The purpose of this thesis is to provide an overview of several Extended Reality application cases in the construction industry. There is a lot of room for pushing digitalisation forward with the latest hardware and software. The study's goal was to figure out how data flows from modelling programmes to environments that support Extended Reality. The study's other goal was to collect and group applications of this technology. A new table architecture was developed with the goal of achieving consistent classification, and it was supplemented with a clear graph.

Javad Shahmoradi, Elaheh Talebi, Pedram Roghanchi and Mostafa Hassanalian [2020] - This document aims to provide a comprehensive overview of the current state of drone technology. Applications in the mining industry, growing interest in the mining industry when using drones for daily work. These applications include 3D mining mapping. Environment, ore control, mapping of rock heterogeneity, measurement of rock debris after explosion, and the sustainability monitoring of tailings dams, to name just a few.

Gayatri Mahajan [2021] - The purpose of this work is The potential of DT in the construction industry has been expanded to better understand the following issues: (i) the benefits of drones in CI and the effectsof , (ii) the recording of drones in CI. Disadvantages (iii) BIM and DT integration range and length Volume (iv) Detailed description and enumeration ofapplication and drone use in CI (v) Appropriate construction progress of from land purchase to completion Using drones per construction stages for monitoring Theproject (vi) finally added a note on the impact of COVID 19 on the construction. This study (2012-2021) also describes the challenges, opportunities, constraints, and strategies for introducing drones into construction.

R. S. Sawant, A. Ravikar, N. Badiya, V. Bellary [2021] - This article is about the use of unmanned aerial vehicles in civil engineering. The article discusses the many types of UAVs used in construction and their benefits and drawbacks. UAVs are being used in civil engineering for a variety of purposes. Drones are instruments that help construction to communicate better, help with safety, can survey large areas from the air, can build things like bridges and roads, and save time and money.

III. RESEARCH METHODOLOGY

Methodology also is a well planning for a research that starts from the beginning until the end of research. The problem of conventional method of visual inspection which is efficient way throughout current time but still it can be questionable on time affect, cost impact and efficiency in documentation process or suitable methods that can meet the objectives can be carried out when the methodology is well planned and followed. There will be five pillars of research area that will generate to four phase of data control and process for each pillars and to tele-back with aims and objectives of this research. The appropriate research design and research methodology will assist to achieve research objectives by clearly shown method of data gaining, data analysis and to generate the information and results.

IV. DISCUSSION

Suraj G. Gupta et al. discussed the importance of UAS in scientific applications has been fully demonstrated in the last years. Prof. Neil D. Opfer et al. using UAVs in high-level laboratory buildings or contractors inspecting atrium interiors will not face FAA restrictions. Javier Irizarry et al. performed a case study to identify potential applications of UAV-derived visual assets for construction management tasks. Jesse Sanchez et al. explores how the latest BIM and Drone technologies and integration lead to high-performance building environments. There is enough research on the topic, but no real-world examples. William Wilkins et al. discussed current and future uses of 3D imaging technologies, including laser scanning, LiDAR, oblique and satellite imaging, photogrammetry, and video surveying. Mark C. Tatum et al. investigated the current use of UAVs in the construction industry. The main focus was on the risks associated with the use of theUAV on construction sites, internal and outsourced resources, as well as the future use of the UAV in construction. Alex Andersson et al. explored how accurate an inexpensive UAV can be in 3D modelling. Dr. Ibrahim Motawa et al. provided an overview of the usage of unmanned aerial vehicles (UAVs) in civil engineering. The article goes on to discuss the many types of UAVs used in construction, as well as their benefits and drawbacks. Masoud Gheisari et al. created an automated system that uses UAVs as a platform for data collection and combines data with new computer vision technologies to detect and monitor fall hazards. Farzad Pour Rahimian et al. worked on the basic and some advanced IT solutions, i.e. prototypes for automated simulation of on-demand construction projects that incorporate images processing, machine learning, BIM and virtual reality. Efosa Alohan et al. examined the current use of BIM in construction projects and the overall workflow improvement of theusing

drones. Suk Bae Lee et al. investigated the possibility of using a UAV to monitor deformation at a highway construction site in South Korea.

V. CONCLUSION

The aim of this research was to look into and determine how the technology is being used by UAVs in the current state of the construction industry. Part of the technology reviewed was related to the photogrammetric, LiDAR, thermography, and combinations of those technologies. The limitations of this research involved working with a technology that is changing rapidly, and the focus was to understand the state of the art technology. There is more research that is needed to understand applications of these technologies on construction job sites. Looking at furthering the research in the UAV, augmented reality (AR) realm will enhance the technology being used already. Continuing with increasing the accuracy of photographs and LiDAR data needs to be studied further, specifically in the construction industry. After this review study one can explore, appraise and synthesise relevant literature related to visual inspection specific focus on ability, usage, evolution, implementation requirement and success factor.

VI. ACKNOWLEDGEMENT

I am highly grateful to thank my guide, Dr. M. M. Bais and co-guide, Prof. S. M. Dhawade, Department of Civil Engineering (CE&M), PRMCOEM Badnera- for their constant intellectual support in the form of innovative ideas and valuable guidance. Their expert suggestions and scholarly feedback had greatly enhanced the effectiveness of this work.

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